Knowledge Transformation In a Mobile Learning Environment

An Interpretive Inquiry of Ubiquitous Context and Social Presence Awareness

A

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THESIS ABSTRACT

One of the most fundamental facets of knowledge is that it transforms as an outcome of individuals sharing experiences through interaction. Knowledge transformation is when there is a shift in view, perspective and the thought process consequent to a social activity. The problem for a contact university is that mobile learners do not have access to consistent social resources for academic support as they drift from formal to informal learning contexts. The alternative for these learners is to engage in a learning activity through social interaction with knowledgeable peers who share a background. Learning actions are influenced by changes in the environment and social awareness. Social awareness is synonymous with awareness of context and social presence. This research was a learning expedition towards understanding the phenomenon of ubiquitous mobile learning where knowledge transformation is a result of social awareness activities of mobile learners as they traverse varied learning contexts. Mobile learning is signified by mobility of learners regardless of mobile technology.

Literature and studies on the phenomenon of social awareness and knowledge transformation in mobile environments were problematized as incomplete and inadequate. This inquiry addresses the identified incompleteness and inadequacies in the literature.

The empirical research was carried out at the University of Cape Town upper campus and residences using a Contextual Inquiry methodology. Contextual Inquiry is an interpretive research framework that depends on interactions with actors in the context of their work. It is based on ethnography, where the researcher goes into the participant's own environment as an explicit step toward understanding who the actors really are and how they go about mundane activities. The contextual inquiry utilized four case units: mobile technology mediated interactions, observation of learning environments, contextual interviews with learners engaged in authentic learning tasks, and a qualitative questionnaire. The focus was on how social awareness is used to support the mobility of a learner.

Activity Theory, which draws attention to mediated activity within a social context, was used to explore how mobile learners use social awareness to facilitate their ubiquitous social interactions as they traverse varied learning environments. The practical contribution of the research is the understanding of activity in mobile learning environments and how learners use social awareness to model their actions for the provision of personalized academic support. The thesis is about the advancement of the human-centric approach to knowledge creation and sharing through enhanced person-to-person contact and communication – where context and social presence awareness is of vital significance to how people create, use, and transform knowledge.

The research outcome can inform Information Systems practitioners in the advancement of context aware computing and ubiquitous learning in two ways: firstly, context aware devices – wireless or wired – ought to be designed based on and should be sensitive to the learner's contextual situation, mundane activities and his or her experience of the environment. Secondly, context aware computing and ubiquitous learning information systems ought to be able to mimic or transmit the social awareness of the learner as s/he moves about varied learning contexts.

DEDICATION

This thesis is dedicated to my mother and to the wonderful memories of my brother, Donald Batsile Kekwaletswe (03/06/1971 – 30/09/2007).

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TABLE OF CONTENTS AND OUTLINE OF THE THESIS

CHAPTER ONE: INTRODUCTION

> "Knowledge is not a fixed commodity, but a function of our interactions with external resources including tools, media, and other humans." (Ryder & Wilson, 1997)

The above quotation suggests that human knowledge transforms as people socially interact with others and the surrounding environment. Consequently, the research is premised on the notion that knowledge is created and transferred through the dynamic interactions among individuals and between individuals and their environments (Nonaka et al., 2000) and the concept that knowledge transforms while and during the very process of its transfer (Shariq, 1999). The theory of transformation is that the identification of any given action or knowledge is subject to infinite revision (Gergen, 1994). Therefore, knowledge transformation is social and sensitive to context. Subsequently, several studies (e.g., Weick and Ashford, 2001; Bandura, 1986) have claimed that learning experiences based on interaction and collaboration support learning while building a support network to enhance learning outcomes.

It is inferred from the notion of knowledge creation, sharing or transfer that knowledge can be perceived to transform when context and social presence awareness interact. In this regard, context and presence awareness influence the interaction and the problems that could be solved and how they are solved. Although a great number of studies (e.g., Carlile and Rebentisch, 2003; Nonaka et al., 2000; Shariq, 1999; Polanyi, 1966; 1958) have shown that knowledge creation and transfer is essentially a human-to-human process or an outcome of social interaction (Nonaka, 1994), the relationships or roles of context and social presence awareness as catalysts for knowledge transformation in a mobile learning

environment has not been explored. This research aimed to make a contribution in this regard.

> "If the persons training a child primarily set themselves the goal of imparting knowledge of some sort or other and pay little attention to how the child itself goes about it, by what operations it solves the school problem it has been set, and does not check whether a further transformation is taking place at the proper time in these operations, their development can be disturbed" (Leont'ev, 1981: p432).

This research is about exploring and understanding "how the child itself goes about it", revealing the actual nature of ubiquitous mobile learning through social interaction where social awareness is argued to be the underlying process or activity. The thesis is on how knowledge transforms in a mobile learning environment as an outcome of social interaction coordinated by social awareness. In this research, social awareness is synonymous with awareness of context and social presence. Mobile learners use awareness of context and social presence as a means to access social support, interpret and adjust their knowledge – sharing what they know with others through social interaction. The research applies the interpretive research paradigm to understand how a mobile learner uses social awareness to transform knowledge.

The rest of this introductory chapter is laid out as follows: First, Information Systems Research is contextualized and focused on the mobile learning environment as an Information System. Next, the background of the research problem is discussed, leading to a problem formulation. This is followed by the thesis argument and motivation, and the purpose of the research. The research questions are then presented. Before the chapter

is concluded, the contribution that the research makes to the relevant body of knowledge is briefly discussed, and will be revisited in the last chapter.

1.1 Contextualizing the Information Systems Research

There is an ongoing debate on whether Information Systems (IS) can maintain and grow as an independent discipline (Watson et al.,1999) and whether IS should be viewed as a scientific discipline (Khazanchi and Munkvold, 2000). Others see IS merely as a subset of the varied reference disciplines from which the field has borrowed, such as computer science and organizational science (Benbasat and Weber, 1996), with claims leveled against IS research as being reactive and impractical, resulting in limited relevance of research outcomes to IS practitioners (Benbasat and Zmud, 1999; Ciborra, 1998). The preceding issues are perpetuated by the cross disciplinary nature of Information Systems.

The multitude of perspectives as to what constitute Information systems research necessitates contextualizing the research by providing a definition of information systems within this work. The information systems field of study is broad since it is concerned with IS and their relations with the organization and the people they serve (Land, 1986). Accordingly, both IS academics and practitioners have increasingly begun to realize that it is more appropriate to extend the focus of study to include behavioural and organizational considerations (Galliers and Land, 1987). In view of this, an Information System comprises of three elements – application system, task, and human.

A mobile learning environment, in the context of this research, is seen as an information system. The learning environment is viewed as a social system where the learner as a human, evaluates and interprets contextual

information for a specific learning task and application, using social awareness. Knowledge is inferred to transform during engagement.

The next sections address the extent to which this information systems research is relevant by highlighting the existing problem, the argument and the purpose of the inquiry.

1.2 Background to the Research Problem

> "Knowledge is always gained through action and for action. From this starting point, to question the validity of social knowledge is to question, not how to develop a reflective science about action, but how to develop genuinely well-informed action" (Torbert, 1991).

Torbert (1991) posits that knowledge is achievable through well-informed human action. It is thus important to briefly focus on the two ways by which learners gain or access knowledge.

Creating, managing, reusing and sharing knowledge is generally classified into two categories: technology-centric (TC) and human-centric (HC). The TC approach emphasizes codifying and disseminating knowledge through extensive applications of Information and Communication Technologies. Although the TC approach is poorly equipped to transfer tacit knowledge it fosters knowledge re-utilization and reduces the cost of knowledge reuse by offering access to codified knowledge, and avoids time-space barriers through computer-based databases and networks (Brensen et al., 2003; Hansen et al., 1999).

In a mobile learning environment, Web-based learning resources and electronic books accessible through wired or wireless computer devices

act as examples of a technology-centric approach. On the other hand, the human-centric approach stresses knowledge flow through enhancing person-to-person contacts and communications (op. cit.). Thus, for environments where learners have diverse cultural and educational backgrounds, the human-centric approach is the better approach to transfer tacit knowledge through sharing of learning experiences.

Although there is an aspect of the technology-centric approach in this research where learners use desktop or laptop PCs and PDAs to access knowledge resources, human-centric – i.e., learner-to-learner interactions – is the approach of interest followed in the study. According to Nonaka and Takeuchi (1995), tacit knowledge is naturally and effectively conveyed among individuals through personal (social) interactions. Active socialization produces communal tacit knowledge (Leonard and Sensiper, 1998). Since socialization is a two-way process, the success of the HC approach is largely dependent upon contextual factors, such as opportunities, space, time, socio-cultural influences, and group climates (Jiangdian and Hua, 2004).

In the study, learners are mobile and not confined to particular learning locations and environments. Learner-to-learner on-demand and opportunistic interactions are mediated by mobile phones and PDAs for those who are not in the same location. Face-to-face interactions happen in two ways: spontaneously as learners accidentally meet each other or via a planned social meeting – when they share the same space and time.

1.2.1 Thesis Vocabulary

At this point, it is necessary to unpack and define the key terms or vocabulary that forms an integral part of the thesis. The terms, social

interaction, awareness, social awareness, knowledge transformation and mobile learning, are discussed and re-defined in the following sections. Activity theory, a theoretical lens used to understand learners' actions and activity, is discussed in chapter three. Context awareness and social presence are also discussed at length in chapter three – the following paragraphs, for purposes of understanding the research argument and questions, only succinctly highlight the adopted definitions of social presence and context awareness.

1.2.1.1 Thesis Definition of Social Presence

In the research, learners use awareness of a social presence to engage in a social interaction whose outcome is knowledge transformation. In the inquiry, social presence is re-defined and understood to be the mediated presence or the face-to-face presence of another learner who could provide personalized on-demand social support for a learning problem as the learner traverses varied learning contexts.

1.2.1.2 Thesis Definition of Context

The thesis looks at context awareness where context is defined to include: a learner's location and environment, a learner as the participant (including his or her socio-cultural background), social interaction as well as activities. The "environment" category contains context factors that are outside of the control of a learner, such as the weather. The "participant" category includes the status (mental and physical) of the learner or other learners. The "activities" category covers learner, participant, and environmental activities. "Interactions" deal with those characteristics that pertain to relationships between individual learners, their activities, and the environment.

1.2.1.3 Social Interaction

Learning and knowledge transformation are tied together with social interaction – conversations, exchange of ideas and interactivity. Interaction is considered as "central to the expectations of teachers and learners in education and is a primary goal of the educational process" (Hillman et al., 1994). To stress the importance of interaction, the largest US education union, the National Education Association has named "interactivity" as one of the ten standards for quality education (www.nea.org).

Types of Social Interaction

There are four types of interaction: learner-instructor interaction, learner-to-learner interaction, learner-content interaction (Moore, 1989) and instructor-content interaction. In the traditional classroom, interaction between teachers and students is a concern in explaining the cognitive learning of students, their confidence in their own abilities and their general interest in learning (Bloom, 1981). Interaction between instructors and learners can build learner motivation and involvement and is listed as one of the seven principles for "good practice" in education by Chickering and Gamson (1987).

Learner-to-learner interaction is very important for a variety of learning styles and essential to learner satisfaction. Reciprocity and cooperation among students, whether in traditional classrooms or mediated, enriches the learning atmosphere. It allows students to share ideas through collaboration and to respond to others using critical thinking and problem-solving skills (Chickering and Gamson, 1987). Learning is enhanced when it is done as a team effort rather than a solo event or battle. Effective learning happens when it is collaborative and social, not competitive and

isolated. Working with others often increases involvement in learning. Sharing one's own ideas and responding to others' reactions sharpens thinking and deepens understanding (*ibid.*).

The third type of interaction, learner-content interaction, is seen as the "basis for, and defining characteristic of all types of education," since the "process of intellectually interacting with the content results in changes in the learner's understanding" (Moore, 1989 p6). Learner-content interaction includes "the internal, didactic interaction between learners and one-way media, including correspondence text, and electronic media such as broadcast television, interactive videodisc, and audio-tapes" (*ibid.*).

1.2.1.3.1 Thesis definition of Social Interaction

Although there are four types of interaction, mentioned above, the study is only concerned with the learner-to-learner interaction. In this interaction, learners share ideas and experiences through on-demand consultation and responding to others for the purpose of solving a learning problem.
I therefore define social interaction as the problem-driven interaction and sharing of learning experiences as the learner traverses varied learning contexts.

1.2.1.4 Awareness

Awareness is an understanding of the activities of others, which provides a context for your own activity (Dourish and Bly, 1992). Christiansen and Maglaughlin (2003) identified and grouped four types of awareness as follows: *workplace awareness* – which is knowledge of tasks within the virtual environment; *availability awareness* – which relates to the availability of people and objects; *group awareness* – which promotes the

feeling of belonging to a group; and *contextual awareness* – which includes the physical, social, and mental contexts. Awareness, by the foregoing definitions, is both a perception of the users of a system, and an aspect of a system that facilitates that perception (Rettie, 2003).

I argue, based on empirical evidence discussed in chapter five, that mobile learners need to constantly preserve an eminent extent of *availability awareness and contextual awareness* in order to be able to accomplish a learning and knowledge transforming task. The awareness is needed by a learner to maintain a comfortable and relaxed sense in a learning environment and to be able to act effectively in both learning and social interaction.

1.2.1.4.1 Social Awareness

Numerous different definitions of social awareness have been put forward in the literature (e.g., Prinz, 1999; Tollmar et al., 1996; Gutwin et al.,1996). In general, however, social awareness is defined as awareness about the social situation of other people. That is, what they are doing, whether they are engaged in an activity and could be disturbed, who is around and what is going on. In a mobile learning environment, social awareness accommodates awareness of particular social situations at varied and specific learning moments. Dourish and Bellotti (1992) define social awareness as an understanding of the activities of others, which provides a context for your own activity.

1.2.1.4.2 Thesis definition of Social Awareness

In this mobile learning environment research, social awareness is defined to be awareness of the situation of other learners including their presence, physical location, mental status, activities and other relevant social

processes for the purposes of social interaction whose outcome is knowledge transformation. Consequently, social awareness in the thesis refers to the mindfulness or mental state of a learner in terms of the importance and personal relevance of a situation to the learner and the learning problem. Thus, in this thesis, social awareness is regarded as synonymous with awareness of context and social presence.

1.2.1.5 Knowledge transformation

The concepts of knowledge and how it is created and transferred (e.g., Nonaka et al., 2000; Dixon, 2000; Nonaka, 1994; 1991) are discussed at length in chapter two. However, to define knowledge transformation for the purpose of the research argument and clarity of the research questions, I succinctly articulate the premise for the definition.

Knowledge transfer is the process through which one unit – in the study a unit is a learner or a group of learners – is affected by the experience of another (Argote and Ingram, 2000, p152). In the research, knowledge transfer is fundamentally a learner-to-learner interaction process. Based on the case study evidence I therefore argue that the success of knowledge transfer depends on the social awareness of learners. Various contexts play a role between the moment when knowledge is stored and when it is retrieved. Subsequently, the retrospective context – the sequence of activities and events occurring prior to the action in question, and the emergent context – relevant activities and events following the action in question (Gergen, 1994), influence the knowledge transfer.

Knowledge transforms while and during the very process of its transfer (Shariq, 1999). The theory of knowledge transformation is that the identification of any given action or knowledge is subject to infinite revision (Gergen, 1994). Gergen posits that "as we are exposed to the events from

both retrospective and emergent contexts, our manner of identifying the present action is subject to continuous modification. Theoretically, this process is without limit" (*op. cit.,* p62).

1.2.1.5.1 Thesis definition of Knowledge Transformation

In the research, knowledge transformation conveys the shift in view or perspective, including the shift in the thought process of a learner as an outcome of social interaction. Specifically, knowledge transformation is defined to be the outcome of social interaction, where interaction is a consequence of social awareness.

1.2.1.6 Mobile Learning

Mobile learning research is still in its infancy, hence there are ongoing debates as to what really signifies mobile learning. In June 2006, European researchers convened for the *Big Issues in Mobile Learning Workshop* (Sharples, 2006). The Workshop aimed to provide a forum for reflecting on the issues behind the growth in mobile learning and for identifying the big challenges facing mobile learning. One issue that became apparent is that mobile learning is not just about learning using portable devices, but learning across contexts. Mobile learning is not something that people do; learning is what people do. With technology getting smaller, more personal, ubiquitous, and powerful, it better support a mobile society (*op.cit.*).

In earlier research, the mobile learning concept was strongly linked to the device (e.g., Sharples et al., 2002) and the potential for enabling lifelong learning (e.g., Sharples, 2000). During the last few years, researchers are beginning to also view mobile learning as being about learners on the move rather than the device, with the focus therefore shifting to the

mobility of the learner. This led to considering mobile learning from the learner's point of view, and to the definition that mobile learning is "any sort of learning that happens when the learner is not at a fixed, predetermined location or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies" (O'Malley et al., 2003).

At the Big Issues in Mobile Learning Workshop (Sharples, 2006) there was general agreement that a precise definition of mobile learning is unattainable. Instead, Winters (2006) and other workshop participants agreed on the following key characteristics of mobile learning:

- Enables knowledge building by learners in different contexts
- Enables learners to construct understandings
- Mobile technology often changes the pattern of learning/work activity
- The context of mobile learning is about more than time and space.

Again, discussions on the "Big Issues in Mobile Learning" (Sharples, 2006) allude to the on going debate on what really signifies mobile learning. There are generally three schools of thoughts on what signifies mobile learning: Learning mediated by mobile devices, Mobility of learners (regardless of their devices), and Mobility of content/resources in the sense that it can be accessed from anywhere (Taylor, 2006). This research takes the route of mobile learning signified by mobility of learners regardless of their device.

1.2.1.6.1 Thesis Definition of Mobile Learning

Mobile learning is proving to be a multifaceted phenomenon; therefore, there is still a debate as to what constitutes mobile learning and a clear

definition of it is lacking. This research embraces the viewpoint of a learner being mobile; thus, mobile learning is signified by mobility of learners regardless of their mobile devices. In this study, mobile learning is defined as any sort of learning and knowledge transformation that happens due to social awareness when the learner is not at a fixed, predetermined location but rather in varied learning contexts. The learner may or may not take advantage of learning opportunities offered by mobile technologies. In other words, mobile learning is ubiquitous learning that is not confined to specific locations, is time independent and also happens during face-to-face interaction.

1.3 Problem Formulation

The objective of the inquiry was not to confirm previously established premises and theories but to find out, through engagement with learners, how they, as they traverse varied learning locations, interpret and use awareness of context and social presence for interaction whose outcome is learning and knowledge transformation. I argue that the effectiveness of knowledge transformation is fundamentally affected by the social interaction and the context in which a problem-driven learning activity takes place. There are three types of contexts within which a learner is mobile and for which a learner needs social awareness as a medium to transform knowledge. The following three learning contexts have been discussed in Kekwaletswe and Ng'ambi (2006a).

1.3.1 Formal Learning Contexts

These contexts represent formal structures – such as scheduled lectures and laboratory sessions – in which a learner's behaviour and action is

shaped according to the university class timetable. Interaction in these spaces is usually one-way from instructor to learner using English as the official language of instruction, although learners often interact with each other using their own diverse languages. In the formal learning context, the instructor delivers a lecture and a learner either takes notes or is given a handout. Even though learners are invited to ask questions, there is little time to assimilate the material and meaningfully engage with the learning materials (Ng'ambi, 2004). Learning and knowledge seeking action is, therefore, mostly passive. In this context, social presence is usually availed through wired PCs in the computer labs and the face-to-face presence of tutors, instructors and peers.

1.3.2 Semi-Formal Learning Contexts

These contexts represent informal spaces on campus used by learners, usually while waiting for the next lecture to start or after it finishes. They include the library, cafeteria, mingling areas and walk-in laboratories. As learners begin to reflect on the previous lecture and skim through the learning materials, questions begin to arise for which clarifications are required (Ng'ambi and Hardman, 2004). The challenge a learner is faced with is how to find an instructor or tutor who is available for immediate or on-demand consultation.

Most instructors schedule consultations and are often unavailable for *ad hoc* interactions. The dilemma for most learners is that the consultation periods are limited and not always suitable (Ng'ambi, 2004). Consequently, the learner's alternative is to find the nearest socially present knowledgeable peer or class-mate who can provide social support (Kekwaletswe and Ng'ambi, 2006b). In the semi-formal learning context social presence is still availed through wired PCs in the computer labs and face-to-face presence of peers. Since the environment is on campus,

where most learners meet and come for formal classes, a learner is still very much aware of the available social network.

1.3.3 Informal Learning Contexts

Although it is difficult to be explicit on the characteristics of an informal learning context, these contexts include working during after-hours or weekends at university residences or private homes. In these environments, a learner usually uses his or her mother tongue to consult with peers (Kekwaletswe, 2006) or may write down questions to ask the instructor when they do get into the formal context (Ng'ambi, 2004). There are three things that must be known to provide ubiquitous personalized learning and knowledge support to a mobile learner in an informal learning environment: a) Knowledge about the location of a learner so as to help identify the potential knowledgeable peer; b) the preferred language of a learner in which he or she is likely to be conversant, and c) the awareness of a peer's social presence and contexts – including location and situation (Kekwaletswe, 2006).

1.3.4 The Problem

One of the prevailing educational challenges in the new South Africa is that of providing personalized academic support to under-prepared learners (Jaffer et al., 2006). In a contact university, where students attend formal lectures and scheduled laboratory sessions, there tends to be inconsistency in social presence or access to available social networks for academic support between when learners are on campus and off campus (Kekwaletswe, 2006). Based on empirical evidence, I argue that in a learning environment that has a learner population with diverse social backgrounds and languages, social awareness of peers with a shared

background is fundamental in the provision of personalized academic and social support to a mobile learner. I distinguish between a mobile learner being on campus in a formal context and being on campus or off campus in informal contexts.

Since knowledge transformation and learning tasks are not confined to particular locations but are carried across different learning contexts, I argue that the social resources available to learners ought to move with a learner. I use the term resources pragmatically to mean knowledgeable peers, tutors, instructors and the awareness of context and presence (Kekwaletswe, 2006; Kekwaletswe and Ng'ambi, 2006a). In this regard, the problem is that of ensuring that the quality of resources available to learners remains consistent for supporting a knowledge transforming task or action regardless of time and location of a learner (Kekwaletswe, 2006). In other words, learners should have a consistent social awareness of presence and context. The argument is that when learners solve and engage in a learning task – problem based learning – they bring prior knowledge and experience to the social interaction situation, where the knowledge transformation outcome is influenced by awareness of context and social presence.

1.3.4.1 Empirical inquiry in Formal Learning Contexts

Interactions of learners in formal learning contexts at the University of Cape Town – as a contact university – are usually passive (Ng'ambi, 2004). That is, learners who are mobile hardly need to actively interact with each other in a formal lecture. My assumption is that it is mostly outside the formal contexts that university learners, notably at UCT, begin to interpret and engage effectively with learning materials and therefore need social presence and context awareness about available peers for social support. Since awareness of context and social presence is not yet

much of a need of learners in formal environments the empirical inquiry does not focus on formal learning contexts. The empirical evidence suggests that social interaction of learners, where they begin to simplify meanings and begin to apply what they have learned in class, happens mostly outside of the formal learning context.

My argument is that South African learners, who traverse varied locations, need more personalized academic support through social awareness as they move away from formal learning contexts. In view of that, the empirical study and evidence does not include formal learning contexts but focuses on semi-formal and informal learning contexts.

1.3.5. Local Research Context

Learners in South African universities come from very diverse backgrounds, with different languages and cultures. In view of that, I argue that social awareness of knowledgeable peers with shared backgrounds, languages and cultures, regardless of the learning location would enrich the knowledge sharing and learning experience (Kekwaletswe, 2006). Some learners come from previously disadvantaged schooling systems where contact or one-on-one interaction with an instructor is unusual due to the poor faculty-to-learner ratio and scarce resources. That is, in South African schools it is not uncommon to find that learners hardly have contact with the instructor or tutor outside of the formal class or laboratory sessions. One of the reasons for this is that an instructor is often responsible for several formal classes which leave less room for him or her to personalize interaction with learners outside the formal contexts.

Providing personalized academic support to under-prepared learners remains one of the prevailing educational challenges in South Africa (Jaffer et al., 2006). In view of that, the benefit of providing personalized

support to learners' learning experiences through social awareness that facilitates social interaction with peers could be enormous.

The practical relevance of the research is toward enriching personalized on-demand academic support through social awareness. The ideal social awareness for knowledge sharing and social support is one that is sensitive to the background of a learner (social context includes culture and language), arranging these aspects to provide immediacy on the available social network, independent of the learner's location and task at hand (Kekwaletswe and Ng'ambi, 2006b). The focal point of the thesis is therefore how social awareness is used to support personalized social interaction for a South African university learner as s/he traverses varied learning contexts.

The practical contribution of the thesis is an informed understanding of a ubiquitous learning and knowledge transforming environment that supports the mobility of a South African learner – facilitating on-demand "anywhere, anytime" consultation and continuously assuring a learner of the availability of a support network. To this end, the study was on ubiquitous communication and social interaction that supports learner mobility across semi-formal and informal learning contexts.

1.4 Thesis Argument and Motivation

The notion of social interaction presupposes an existence of two or more learners speaking and/or acting. Embedded in this notion is the assumption that a learning community is available without which interaction is impossible. Nevertheless, the lack of increased social presence and context awareness makes it difficult to provide learners with context sensitive and ubiquitous support in a learning environment where learners are mobile (Kekwaletswe, 2006). In conventional interaction with

the learning activity, learners have an impoverished mechanism for providing social awareness of the available social network. Consequently, personalized social support is denied when learners do not have the opportunity to access a consistent social network (*ibid.*).

In order to understand social presence and context awareness and their role in a mobile learning environment, we must understand both what the context is and how social awareness can be used to facilitate the ubiquitous learning. An understanding of the context and a sense of social presence enables the learner to model behaviour along the expectations or the shared understanding of a social learning community.

In the preceding sections, I have discussed the challenge of providing personalized social support to a mobile learner and I have argued that the challenge could be alleviated through enriched social awareness of knowledgeable peers. The objective of the research was to understand how knowledge transformation in a mobile learning environment is a consequence of an awareness of context and social presence. The primary argument is that knowledge transformation is the outcome of social interaction facilitated through social awareness; and social awareness is synonymous with context and social presence awareness. The awareness of context and social presence happens in the mind of the individual learner. The argument and the subsequent objective of the research are motivated by the following three challenges for a mobile learning environment:

1. Learning and knowledge transformation that happen when a learner is mobile is considerably more situated than learning that happens in formal contexts. It is almost impossible to plan, since the precise unfolding of events in varied settings cannot be anticipated. At the same time, experiences made during mobile

learning need to be captured by a learner for the benefit of knowledge transformation through social interaction with others.

2. Learning in informal settings renders familiar formal contextual awareness less practical. Context relies on environmental situations and availability of resources which in the case of mobile learning are not always consistent. Therefore, to provide personalized social support, a mobile learning environment requires improved support for awareness of presence of other learners and knowledge resources as well as awareness of environmental and activity context.

3. Unlike learning in a formal context, much of the learning that happens while mobile is often through support from socially present peers or class-mates. Nevertheless, mobile learners have less awareness of the ongoing situations including activities of others. Given that the abilities and capabilities of learners to participate in synchronous supportive learning are hidden, context and social presence awareness mechanisms are necessary for the social interaction.

With the three challenges facing a mobile learner – who needs ubiquitous personalized social support – there is a need to understand how a learner uses social awareness for the purpose of social interaction whose outcome is knowledge transformation, as claimed in my argument articulated above. To this end, the objective of the research is to contribute to the body of knowledge by giving an informed understanding of how learners go about transforming knowledge in a mobile learning environment.

1.4.1 Conclusion of Argument: CA/SP Awareness Rationale

When learners are engaged in a learning activity, they are able to use implicit and contextual awareness to increase or decrease the social interaction. Since knowledge is the outcome of learners socially interacting and sharing experiences, learning is foundationally a social activity and the phenomena of social presence and context awareness for interaction decisions could be inferred to be very much related. It is thus necessary that learners have context and social presence awareness of available social networks. The social network concept is discussed further in chapter two.

In a contact university setting, knowledge transformation generally takes place in three different learning contexts: formal, semi-formal, and informal (Kekwaletswe and Ng'ambi, 2006a). As learners move across different learning contexts, they do not have access to the same social networks for consultation and hence receive inconsistent social support depending on where they are. Acknowledging that a learner is mobile, I argue for a mobile learning environment that supports the learner's mobility across the varied learning contexts. The characteristic of the environment is social presence and context awareness for social interaction whose outcome is knowledge transformation.

In the inquiry, learning is the ubiquitous social interaction in which knowledge is an outcome of learners sharing experiences and knowledge transformation occurs when there is a shift in knowledge or perspective due to the social interaction.

The assumption is that learning tasks are constant. In other words, the tasks are the same regardless of a learning location – but a mobile learner carries them in different environments. In this regard, my argument is that awareness of context and social presence is a useful characteristic of a

learning environment in which a learner is engaged in a learning activity in varied locations. I argue that when learners have social awareness, they are able to get on-demand personalized social support from peers. The research, therefore, is about a social awareness-driven learning environment that supports a learner's mobility. In the research, social interaction – which is synonymous with problem-driven interaction and sharing of learning experiences – is afforded and experienced through face-to-face meetings or mediated by mobile communication.

1.5 Purpose of the Research

The general outlook at the IEEE International Conference on Sensor Networks, Ubiquitous, and Trustworthy Computing (http://sutc2006.asia.edu.tw/) held in conjunction with the IEEE International Workshop on Context Aware Ubiquitous Learning (http://caul2006.ncu.edu.tw/) – where the author presented a paper – was that further research is needed to inform the innovation and practice of ubiquitous computing and wireless networks. That is, there is a growing need to identify emerging research topics that will define the future practice and advancements of wireless networks and ubiquitous computing. Within the umbrella of ubiquitous computing, context aware ubiquitous learning is one area that needs further refinement through empirical research. The research aimed to contribute to that refinement by exploring and understanding the usefulness of social awareness in ubiquitous mobile learning.

Context aware ubiquitous learning is the computer supported learning paradigm for identifying learners' surrounding environment, context and social presence to provide integrated, interoperable, pervasive, and seamless learning experiences. The objective of context aware ubiquitous learning is to advance Web-based and mobile learning a step further from

learning anywhere at anytime to being at the right time and at the right place with appropriate learning resources and knowledgeable peers. The study proposes that learner social interaction facilitated through social awareness provides the personalized learning support needed for learning "at the right time anytime anywhere".

Context aware ubiquitous learning is meant to support learning by identifying learners' surrounding contextual environment and social presence to provide a rounded and seamless learning experience. The purpose of the research is practice-based since its outcome offers a valuable understanding of how learners use awareness of context and social presence for purposes of on-demand social interaction – that is, sharing problem-driven learning experiences while traversing varied learning contexts.

1.6 Research Questions

The main assumption of the inquiry is that it is the learner who is mobile and not the mediating mobile technologies. In addition, I assume a constant learning task but a mobile learner carrying both the task and a mobile device (or accessing resources through a wired device) in varied learning contexts. How much knowledge is transformed in a mobile learning environment is not the scope of this research; hence, there is no learning outcome or assessment to measure the extent of transformation.

Even though the inquiry addresses context, presence, mobile and wired communication technology, its emphasis is not on how learners engage with the technology but rather how learners engage with social settings and in a learning activity with others who may or may not be in the same settings as they traverse varied learning contexts. It focuses on how

learners interpret awareness of context and presence for purposes of transforming knowledge. Ubiquitous mobile learning is a fairly new area within the information systems field. Hence, the objective is to understand, through empirical research, how social awareness in a mobile learning environment is relevant for the social interaction whose outcome is knowledge transformation.

Having articulated the problems learners encounter in varied learning environments and the argument that knowledge transformation is a consequence of the awareness context and social presence, I put forward the research questions that drive the rest of the thesis.

1.6.1 Research Questions Framework

The primary question driving the expedition was the research question: How does awareness of context and social presence impact knowledge transformation in a mobile learning environment? I have already noted that awareness of context and social presence is synonymous with social awareness and that in the research; a learning activity is the same as a knowledge transforming activity. Thus, the primary research question is similar to asking how social awareness influences a knowledge transforming action or decision. In this regard, the main research question is broken down into the secondary question – how does social awareness influence a learning activity? – Which results in two next level questions focused and addressed in the research. As shown in figure 1, social awareness is constituted by awareness of context and social presence, hence the two questions.

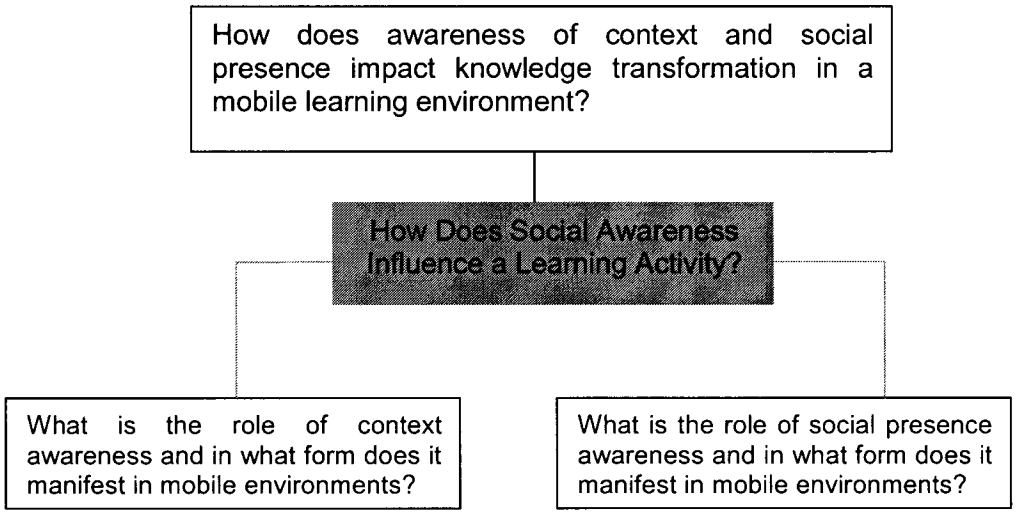

Fig 1. The Research Question Framework

I view a mobile learning environment as a social system where processes and actions that transform knowledge are coordinated by social awareness. The interest of the inquiry is confined specifically to awareness of context and social presence changes occurring while the learner traverses different learning contexts or locations. The interest is in the interplay between the dynamic context and social presence, mobile learners, and the actions where the outcome is knowledge transformation.

The identification of my research topic is a proactive step in answering a call for emerging research topics in the area of ubiquitous mobile computing and learning (http://caul2006.ncu.edu.tw/; Sharples, 2006). With context-aware ubiquitous learning still in its infancy, the research sought to make an important contribution by providing an informed understanding of mobile learning from the learner's perspective; the research outcome, therefore, has the potential to influence design and practice.

1.6.2 The Research Framework

Now that I have discussed the motivation, the purpose of the inquiry and the research questions that will guide the rest of the research, the next sections focus on the processes that will facilitate the investigation and the social inquiry. The research outlook and framework is depicted by figures 2, 3, and 4.

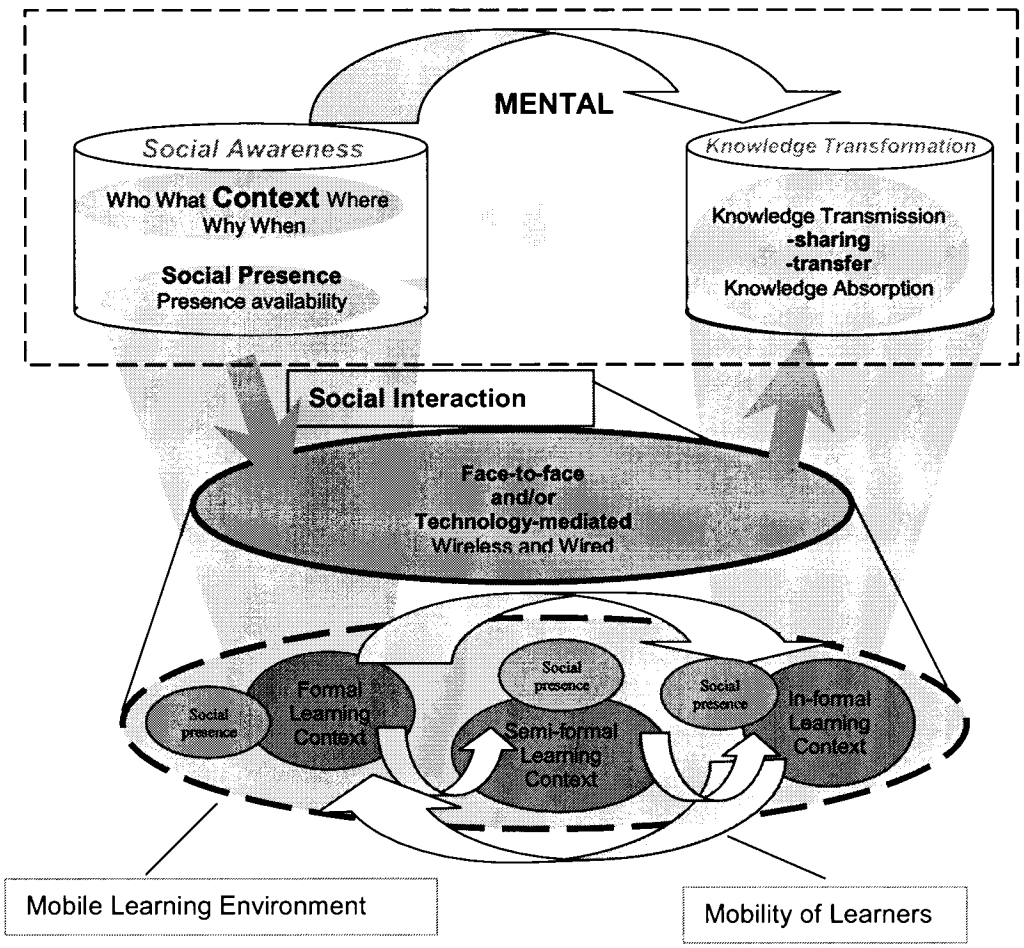

Fig. 2. The Research Framework

The thesis is framed and premised on the argument that learning and knowledge transformation are not confined to particular places and time. In figure 2, there are three stages showing the conceptualized research framework and outlook. The lower stage, *mobile learning environment*, shows the social presence of peers and the learning context of a mobile

learner. Mobility is depicted by arrows that rotate around the varied learning contexts. In this environment, learners either learn in isolation or in the social presence of others.

The second stage depicts the face-to-face and the technology-enabled social interaction. In this stage, learners use wired and wireless devices to communicate with others who may not be in the same location. The top stage shows what happens in the mind of a learner as s/he interacts with peers and learning contexts. It depicts the awareness of context and/or presence as well as the subsequent knowledge transformation. At this level, social awareness catalyzes knowledge transformation, which may lead to further social awareness and further social interaction, with knowledge transformation as an outcome. As learners continue to interact, knowledge transformation cycle continues.

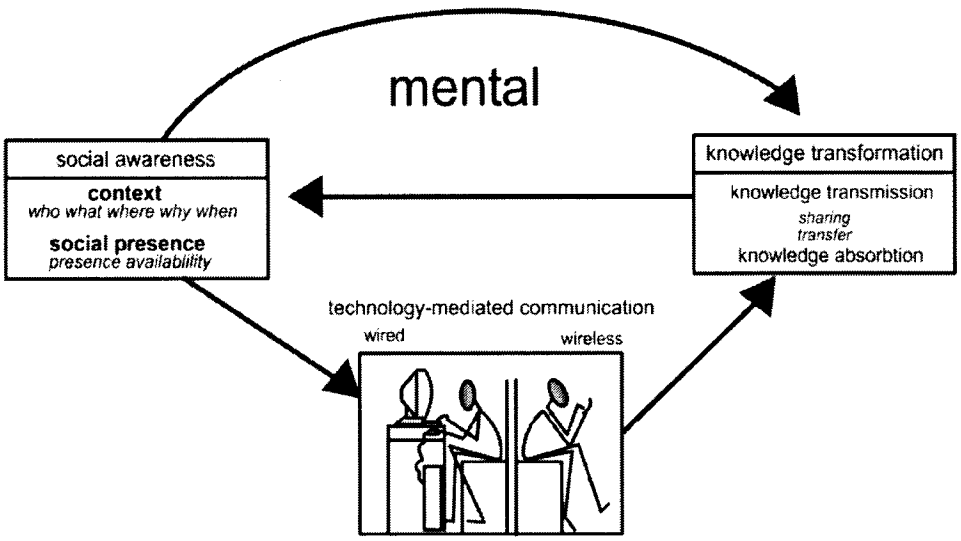

Fig. 3. Representation of the top two levels of the research framework.

In figure 3, learners use social awareness to interact with others who are not in the same location using Web-based mediated communication to send and read emails or chat through instant

messaging. Learners may also pose or respond to questions via a Web-based Dynamic Frequently Asked Question facility – DFAQ – (Ng'ambi, 2004). In the figure, learners also use mobile devices such as PDAs to interact via mobile instant messaging, and mobile phones that could be carried around to interact verbally or send short messages (SMSs).

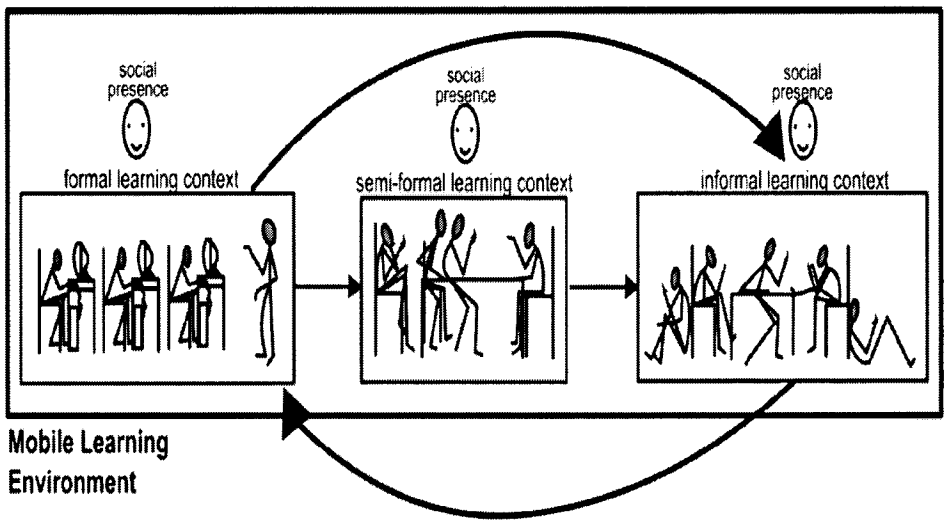

Fig 4. Representation of learner mobility, learning context and presence

Figure 4 shows learners interacting in the three learning contexts. In the semi-formal and informal contexts, learners either engage with a learning task in isolation or with knowledgeable peers who provide the necessary problem-driven social support. The arrows show learner mobility. As they move across different locations, learners use social presence and context awareness to interact with others.

1.7 Contribution to the body of knowledge

An understanding of the context and a sense of social presence enables the learner to model behaviour along the expectations or the shared understanding of a social learning community. The role of education is

transformative, and to the extent that social awareness could model learner behaviour, the phenomenon may have educational value. Thus, the aim was to understand social awareness cues in a mobile learning environment where social interaction is usually in the form of synchronous mobile communication and face-to-face. Using Activity Theory as a theoretical lens, the inquiry provides a valuable understanding of how learners use awareness of context and social presence for purposes of on-demand social interaction – that is, how they share problem-driven learning and knowledge experiences while traversing varied learning contexts.

The research observed the dynamic social environments in which learners who are not confined to certain locations interact to transform their knowledge. With an informed understanding of how learners use social awareness whose outcome is knowledge transformation in a mobile learning environment, the inquiry makes the following contributions to the field of information systems and higher education: i) social presence and context awareness is a necessary characteristic in a learning environment where learning is not fixed to particular times and locations, ii) in a learning environment with a population that is diverse in social background and languages, awareness of peers with a shared background can influence knowledge transformation and iii) when a learner can have awareness about another learner's context and activity, this awareness is part of what influences that learner's activity, hence how s/he transforms knowledge. The research contributions are re-visited and discussed further in the last chapter.

1.8 Summary of the Introduction chapter

In the introductory chapter, the thesis vocabulary was addressed and defined. I have argued for the need and relevance of the research by

highlighting the problems and challenges South African learners, who are not confined to particular locations, face. Since mobile learning research is at its infancy, the debate on what signifies mobile learning was highlighted; what signifies mobile learning for this research was defined. In addressing the challenges, I motivated research questions for the inquiry of how and what happens when learners use social awareness for the purpose of social interaction that results in knowledge transformation.

In the next chapter, I discuss the literature that informed the research and review theoretical foundations relevant to the study.

CHAPTER TWO: THEORETICAL FOUNDATIONS

2.0 Introduction

This chapter lays out the epistemological and ontological foundations of the inquiry and reviews the existing literature that informs the thesis. The inquiry is about environments that support learning and knowledge transformations while the learner traverses varied learning contexts. Although the terms learning and knowledge – including various aspects of it (creation, usage, transfer, etc.) – are often used to convey two dissimilar schools of thought, they are thought of in the same light for purposes of the research since knowledge transforms as a result of a learning action and activity. In other words, learners transform their knowledge as they engage with a learning task through social awareness. Consequently, I examine the literature on both learning and knowledge. Even though the thesis also draws from organizational studies, the research is about learners at a university and not the university as an organization.

The chapter proceeds as follows: First, the concept of knowledge is reviewed, followed by a focus on approaches to knowledge. Next, I look at forms of knowledge creation in the context of learning and knowledge sharing. This leads to a review of social networks for transferring and sharing knowledge. The theory of knowledge cannot be divorced from the situations under which knowledge and learning experiences take place, and this is reviewed next, followed by a specific focus on learning environments. Culture manifests as a context for interaction in such environments and receives special attention in a separate section. The final section focuses on mediated interaction and the theory of media communication.

2.1 Knowledge

To understand knowledge and how it transforms in a mobile learning environment as an outcome of social interaction, I unpack the logical development of how knowledge is created, retained, shared and used. The construction of knowledge requires processing of data into information, new information is then created which is then communicated or transferred outside of the human brain. With that premise, I briefly define data as raw facts that can be shaped and formed to create information. Thus information is data that is given a meaning within a context.

Therefore, only data and information can be captured, transferred or stored outside the brain. Knowledge is created from the processing of information, and during this processing, new knowledge can be acquired or created for future use, when more or new information is acquired and processed (Van Beveren, 2002). Knowledge is transformed into information within the brain to be communicated externally through language or demonstration (*ibid.*). Language may include different forms of communication such as text, verbal and body gestures. What then constitutes knowledge?

2.1.1 Defining Knowledge

There are probably as many definitions and explanations of knowledge as there are theories of knowledge from diverse disciplinary perspectives. Without joining the philosophical debate of what exactly knowledge is, it is encouraging to notice that literature in the knowledge or knowledge management discourse has moved away from the positivistic view of knowledge as an objectified and monistic absolute truth (Stenmark, 2001). Instead, most literature has adopted a pluralistic epistemology,

acknowledging that there are many types or forms of human knowledge. The following are only some of the definitions of knowledge.

- Knowledge is an individual's stock of information, skills, experience, beliefs and memories (Alexander et al.,1991).

- Knowledge is the stock of conceptual tools and categories used by humans to create, collect and share information (Laudon and Laudon, 1995)

- Goodman (1978) explains knowledge by asserting that the "making of knowledge is a way of enacting reality, giving existence to things and events, and organizing the world."

- Nonaka (1994) deems knowledge to be "justified true beliefs". The theory of knowledge creation sees knowledge as a dynamic human process of justifying personal beliefs as part of an aspiration for the "truth" (*op. cit.*, p15).

Generally, scholars of knowledge observe knowledge in two ways: "know-how" and "know-that". The former is created 'here and now' in a specific, practical context and conveyed through analogies and metaphors; the latter is contained in manuals and procedures and oriented towards a context-free theory (Patriotta, 2003).

2.1.2 Tacit and Explicit Knowledge

Most knowledge theories can be traced back to the philosopher Michael Polanyi (1966; 1958). By echoing the words "we can know more than we can tell" Polanyi (1966: p4) was insinuating that human beings cannot possibly explicitly express or spell out all they know, thus suggesting that there are two types of human knowledge - tacit and explicit knowledge.

The distinction between tacit and explicit knowledge is the framework of pathfinding studies by Ikujiro Nonaka (e.g., 1991 and 1994), a Japanese scholar.

2.1.2.1 Explicit Knowledge

Explicit knowledge refers to knowledge that can be codified and articulated. Therefore, explicit knowledge can be shared face-to-face or can be transmitted well through various communication media. It is knowledge that is discrete or "digital". Explicit knowledge is captured in records of the past such as libraries, archives, and databases (Nonaka, 1994).

2.1.2.2 Tacit Knowledge

Tacit knowledge involves both cognitive and technical elements. Cognitive elements center on "mental models" in which learners form working models of the world by creating and manipulating analogies in their minds. The technical elements of tacit knowledge cover concrete know-how, crafts, and skills that apply to specific contexts (Nonaka, 1994). Tacit knowledge can sometimes be communicated through the establishment of shared understanding between individuals (Polanyi, 1966). This understanding involves a kind of "parallel processing" of the complexities of current issues, as the different dimensions of a problem are processed simultaneously.

Tacit knowledge is deeply rooted in action, commitment and involvement in a specific context (Nonaka, 1994). Polanyi noted that "commitment" underlies human knowledge creating activities, thus, it is one of the most important components for promoting the formation of knowledge. Tacit knowledge is related to experience and is idiosyncratic. It can be defined

as background knowledge that individuals take for granted in their everyday coping with the world (Patriotta, 2003). Tacit knowledge is most effectively transferred through collaboration, shared experience and rich interpersonal interactions over time (Alavi, 2000).

2.1.3 Knowledge Transformation

Knowledge is created and expanded through a continuous and dynamic interaction between tacit and explicit knowledge. Focusing on the ways in which knowledge is created and shared through the interaction between tacit and explicit knowledge, Nonaka (1994) identifies four possible modes of conversion: Socialization, externalization, internalization, and combination (figure 5).

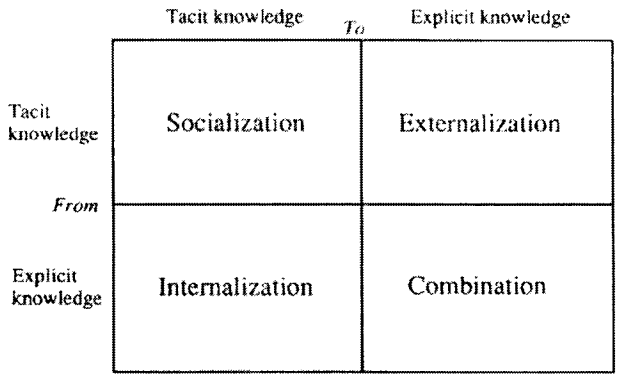

Fig. 5 Modes of knowledge creation (Nonaka, 1994)

Firstly, there is a mode of knowledge conversion that enables human beings to convert tacit knowledge through social interaction between individuals. Individuals can acquire tacit knowledge without language through observation, imitation, and practice. The key to acquiring tacit knowledge is through some form of shared experience, which makes it easier for people to share each other's thinking processes. The process

of creating tacit knowledge through shared experience is called "socialization."

The second mode of knowledge conversion involves the use of social interaction to combine different bodies of explicit knowledge held by individuals. Through meetings and virtual conversations, individuals exchange and combine knowledge. The reconfiguring of existing information through the sorting, adding, and re-contextualizing of explicit knowledge can lead to new knowledge. This process of creating explicit knowledge from explicit knowledge is referred to as "combination."

The third and fourth modes of knowledge conversion relate to patterns of conversion involving both tacit knowledge and explicit knowledge. These modes also show that tacit and explicit knowledge are complementary and can expand over time through a process of mutual interaction. This interaction involves two different operations. One is the conversion of tacit knowledge into explicit knowledge, called "externalization." The other is the conversion of explicit knowledge into tacit knowledge, referred to as "internalization".

Socialization is partially connected to institutional culture; combination is rooted in information processing and internalization has associations with organization learning (Nonaka, 1994). Knowledge creation centers on the interchange between and on the building of both tacit and explicit knowledge through internalization and externalization. Recognizing the practical benefits of tacit knowledge centers on its externalization and amplification through the dynamic interactions between all four modes of knowledge conversions (*op. cit.*, p21). This theory of knowledge creation covers both the epistemological dimension – that is, types of knowledge at hand, and the ontological dimension – that is, knowledge creating entities (Patriotta, 2003).

Although the conversion process is a social process between individuals and not confined within the individual, the knowledge creating entities or the ontological dimension is that knowledge is created only by individuals (Nonaka and Takeuchi, 1995). They affirm that the key to knowledge creation lies in the mobilization and conversion of tacit knowledge and subsequently they emphasize the role of individuals as carriers of knowledge. Essentially, Nonaka and Takeuchi suggest that the central driver of knowledge creation is the transformation of knowledge from one type to the other. Indeed, unlike information, knowledge is about beliefs and commitment and therefore it essentially relates to human action (Kolb, 1979). In view of that, knowledge is linked with the dynamics of interpretation and sense making (Patriotta, 2003).

While Nonaka refers to conversions of knowledge as modes of knowledge creation, I see the conversions as knowledge transformation – where knowledge transforms from one type to the other.

2.1.4 Knowledge as a multifaceted phenomenon

The evolution of institutional knowledge has been informed by a wide spectrum of theoretical traditions. Knowledge is a multifaceted phenomenon which has been debated in a variety of disciplinary contexts – from philosophy and sociology, to social psychology and cognitive science; from economics to management and organization analysis. The breadth and depth of the subject would not allow me to trace a lineage of existing knowledge theories.

Nevertheless, cognitive theories have looked at knowledge as a representational phenomenon. Winograd and Flores (1986) point out that "a cognitive being 'gathers information' about things and builds up a 'mental model' which will be in some respects correct (a faithful

representation of reality) and in other respects incorrect. Knowledge is a storehouse of representations, which can be called upon for use in reasoning and which can be translated into language while thinking is a process of manipulating representations" (*op. cit.*, p73).

In cognition-action theory, the foundational hypothesis is that action always possesses a cognitive basis which is reflected in the representational activities of the mind. The duality of cognition and action underlies the conceptualization of knowing as a computational activity (Patriotta, 2003). Since human behaviour is always oriented towards a goal, action is a form of problem-solving, where the actor's problem is to find a path from some initial state to a desired goal state, given certain situations along the way (Newell and Simon, 1972). Subsequently, new problems need new problem representations because existing problem-solving procedures are based on selective searches through a problem space defined by a particular problem representation (Patriotta, 2003). Accordingly, there is a need for researchers to understand how people acquire new problem representations for dealing with new problems.

In the preceding sections, I highlighted the multifaceted views on knowledge and how it is created. The highlights is what informs my own definition of knowledge transformation Having given an overview of what knowledge is and how it may be created, the following section will highlight transformational learning and how knowledge is shared and transferred.

2.2 Approaches to Knowledge

The following sections highlight the different approaches adapted by scholars in knowledge research.

2.2.1 The Situated Approach to Knowledge

The situated approach (Lave and Wenger, 1991; Brown and Duguid, 1991) to learning and knowledge offers a pragmatic definition of knowledge which is oriented towards the interpretation of performance through the observation of everyday practices in the learning environment. From a situated perspective, knowledge is neither a disembodied cognitive structure nor an objectified commodity. It does not exist outside the nexus of equipment, practices, institutions, and conventions in which it is generated and utilized, but it is somehow 'immanent' to them (Patriotta, 2003). The proposition of immanence underlies the concepts of distributed knowledge systems (Tsoukas, 1996; Hutchins, 1993), activity systems theories (Blackler, 1995; Engeström, 1987), and formative contexts (Ciborra and Lanzara, 1994; Blackler, 1992; Unger, 1987).

Fundamental to the situated approach is the problem of the context in which human action and interaction takes place. The context is described as a composition of interrelated meanings rather than as a mere container of activity removed from everyday practice. Most of the literature within this approach have a common view of learning and knowing as predominantly social activities which take place through participation within a 'community of practice' (Wenger, 1998; Lave and Wenger, 1991; Brown and Duguid, 1991). From such an epistemological standpoint, knowledge is not the property of the individual but is distributed across a social system.

From the situated approach, two elements can be illuminated. The first is an attempt to move away from the disembodied view of knowledge suggested by symbolic cognition in order to stress the social, situated nature of representations (Patriotta, 2003). The second element within the

situated approach is its primary focus on knowledge-producing practices in the learning environment.

I need to distinguish between practices and practice: practices refer to habits, customs, beliefs, principles, pointing to the fact that practices are shared while practice is an activity seeking a goal (Turner, 1994). The interconnectedness of the two terms lies in the fact that practices provide a shared background of readiness to hand for the execution of goal-oriented activities (practice), meaning that practices provide causes for practical activities (Patriotta, 2003). In the following sections I review the main contribution to knowledge theories provided by the situated cognition approach and practice theories.

2.2.2 The Situated Cognition Perspective

The situated cognition approach was envisaged as a reaction to the paradigmatic model of cognition proposed by rational cognitivism (Patriotta, 2003). Proponents of this perspective reject the ontological distinction between a reality 'out there' and the internal representations of a knowing subject. A general theme uniting many situated approaches to cognition is a change in the way the person-environment relationship is envisaged. Rather than a person 'being' in an environment, the activities of person and environment are parts of a mutually constructed whole.

The inside-outside relationship between person and environment is replaced by a part-whole relationship (Bredo, 1994). This change in view is made more plausible by viewing person and environment in terms of their contribution to an activity rather than as separately described things. Observed actively, the alteration of person and environment involves dynamic mutual modification rather than static matching (Patriotta, 2003).

Learning is centered around problem-solving and is intricately related to the context; 'context' here means understanding (a) the problem's conceptual structure as well as (b) the purpose of the activity and (c) the social milieu in which it is embedded (Scribner, 1987).

Patriotta (2003) describes doing and knowing – or what Scribner (1987) calls 'practical thinking' – as open-ended processes of improvisation with the social, material, and experiential resources at hand. Practical problem-solving is consequently an open system that includes components lying outside the formal problem itself – such as objects and information in the environment, goals and interests of the problem-solver, and social relations (Patriotta, 2003) between learners.

2.2.3 Situated Knowledge and the Role of Practice

The situated perspective is informed by a conceptualization of work as practice. Principles leading to the description of work rely on the analysis of procedures, data flows, activities, 'objects', transactions and processes, assuming that 'work' can be ultimately decomposed into such constituent elements (Patriotta, 2003). The inquiry of situated work practices (Ciborra, Patriotta and Erlicher, 1996; Brown and Duguid, 1991) pointed out that work is more than a random collection of analytical abstractions and models to be rationalized. More or less accurately, work is a complex bundle of situated actions and interpretations aimed at making sense of resources and structures (Patriotta, 2003).

The empirical implications of the situational approach are very important in that firstly, if knowledge is embodied in practice it has to be retrieved by following actors in their everyday dealings. Secondly, situations and not individuals become the most appropriate level for analysis. That is, the actions of learners are always shaped, to some degree, by the situation in

which they find themselves. The situation provides the point of contact between the individual and the institution (Pentland, 1992).

Knowledge is situated in the sense that it is highly contingent upon the interaction among people, resources, and routines present in a given situation. For that reason, Ciborra, Patriotta and Erlicher (1996) suggest that each time we study knowledge in an institution we must start from the question "where is knowledge situated?" and look for those features of a situation which constrain or induce intentional performances or at least fall within the scope of attention of the actors in the situation.

2.2.4 Formative contexts: the two-fold structure of practical knowledge

The notion of formative context offers further insight into the concept of practical knowledge (Ciborra and Lanzara, 1994; Blackler, 1992; Unger, 1987). According to this perspective, practical knowledge that informs human action is structured into two distinct levels:

a) It has a noticeable aspect which refers to the level of practices and routines. The execution of work routines is, however, governed by a stock of background knowledge that people usually take for granted and apply in situated actions.

b) The second level, labeled formative context, relates to the tacit, unstated dimension of knowledge within which routines are 'formed' and from which they receive their scope and meaning.

The formative context directs attention to the cognitive, social and material foundations of the context that inform actions. In extending Unger's (1987) ideas about formative context Ciborra and Lanzara (1994, p70) define the

term as "the set of pre-existing institutional arrangements, cognitive frames and imageries that actors routinely enact and bring to a situation of action."

A formative context thus comprises both an institutional and a cognitive dimension and has far-reaching, subtle influences. That is, it constitutes a background situation for action, enforcing constraints, giving direction and meaning, and setting the range of opportunities for undertaking action (*op. cit.*). As detailed by Ciborra and Lanzara, the distinctive feature of the formative context is its dual emphasis on the cognitive and institutional.

The context is 'formative' in that it shapes the ways people perceive, understand, perform and get organized in a situation bounded in space and time. Context is 'formative' because it may help people to see and do things in new ways, or on the contrary, make them stick stubbornly to old ways (Patriotta, 2003). Consequently, the formative context creates paths for learning. The outcome of a formative context is a texture of routines, roles and tasks, a division of labour, and a set of co-ordination mechanisms that come to possess the 'naturalness' for those who execute routines within that context (*op. cit.*).

Situated theories attempt to resolve the divide between cognitive and normative elements of knowledge-making processes within a relational perspective on knowledge. Compared with other approaches the contribution of the situated perspective to the inquiry of knowledge becomes apparent. Firstly, the situated perspective rejects the idea that knowledge emerges from manipulating representations of an objective reality, suggested by symbolic cognition (Scarbrough, 1998). Secondly, the situated approach differs from the current Knowledge-Based Theory (KBT) developed in the field of strategy.

Within the knowledge-based view, knowledge is treated as a strategic asset or commodity and loosely linked to competitive performance. Here, learning is seen as an incremental process based on changes in organizational routines and path-dependency (Patriotta, 2003). In contrast, situated approach theorists see the firm as an activity system characterized by a distinctive task and an idiosyncratic set of practices (*op. cit.*). The situated approach theorists focus on the processes of social construction and the role of institutional contexts in shaping the dynamics of learning and knowledge acquisition. The situated perspective's major strength lies in its relational focus. In this approach, knowledge is conceptualized in a holistic manner drawing attention to the linkage between action, context, and social processes.

2.2.4 Knowledge Benefits: Single and Double-loop Benefits

In this section knowledge sharing is discussed in terms of knowledge benefits. When people turn to others for information and knowledge, they seek to achieve at least five categories of benefits (Cross et al., 2001a, 2001b):

- *Direct Solution:* a specific and detailed answer that addresses a question or problem. It can be either declarative (know-what) or procedural (know-how) that enables the seeker to solve a given problem.

- *Meta-knowledge:* the direction to a source or location of relevant knowledge which may be stored in an articulate form (e.g., paper archives, databases, and various forms of publications) or held by other people.

- *Problem Reformulation:* Knowledge and information which lead them to rethink and reformulate their problems, and re-discover potential solutions.

- *Validation:* to validate knowledge seekers' own solutions or plans, allowing them to more confidently introduce their plans or solutions to others.

- *Legitimation:* benefits by virtue of citing a respected source for reviewing one's idea can increase the credibility of the quality of the idea.

Peter Senge's (1990) work emphasizes that learning environments "are places where people continually expand their capacity (to learn) to achieve the results they truly desire, that nurture expansive patterns of thinking, and in which people continually learn how to learn together." Developing learning capacity is based on building people's mental ability, individually and together, to acquire knowledge or understanding quickly.

Although I look at works (e.g., Jiangdian and Hua, 2004; Senge, 1990) that deal with organizational learning and knowledge, the thesis is about knowledge at the learner level rather than at the institutional (University of Cape Town) level. My assumption is that their work, while at the organizational level, is applicable at the learner level.

In adopting Senge's concept of 'organizational learning' (Senge, 1990), I consider the first two categories of knowledge benefits (discussed above) as *single-loop* benefits, which means that the "advisers" provide knowledge which may not be challenged or questioned by the existing assumptions held by the "consulters" on the questions asked (Cross et al., 2001a). According to Jiangdian and Hua (2004), the *single-loop*

knowledge benefits may have high efficiency of knowledge sharing as the shared knowledge can be applied (figure below).

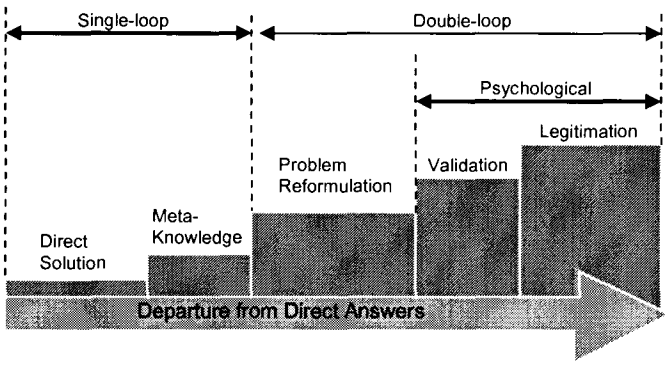

Fig 6. Knowledge Sharing Benefits (Jiangdian and Hua, 2004).

In addition to *single-loop* benefits, knowledge seekers and providers may engage each other in re-shaping the dimensions of a problem space which may be critical to the solutions (Jiangdian and Hua, 2004). Although this kind of benefit may not provide clear solutions directly, they inform the knowledge seekers to comprehend the given problem from another perspective, and thus encourage the exploration into the problem once more.

Similar to 'problem reformulation' the last two benefits trigger knowledge seekers to re-think their problems and plans. In the last two categories of benefits, knowledge seekers may appreciate the psychological and social meanings as social support. The last three knowledge benefits are regarded as *double-loop* benefits, which may result in modification and validation of the problem and plan, together with restructuring the assumptions of the problem. The *double-loop* benefits ensure the effectiveness of knowledge sharing and facilitate knowledge creation (Cross et al., 2001a) when learners question their assumptions and re-think the learning problem.

2.2.5 Types of Knowledge Transfer

The ongoing process of learning by individuals or groups produces knowledge and experience or a know-how that is the source of knowledge. The challenge is that the knowledge created by a source (learner or group of learners) needs to be transferred to and received by other learners or group members who can use that knowledge to perform their learning tasks in ways that make their learning output better.

In this section, I look into the many ways knowledge can be transferred successfully. Although the thesis is about knowledge at the learner level rather than at the institutional level, I look at studies (e.g., Dixon, 2000) that deal with organizational knowledge. My assumption, again, is that knowledge transfer at the organizational level can inform transfer at the learner level or be applied at the learner level.

Nancy Dixon (2000) documents her research findings on how organizations transfer internal knowledge to other teams of people. Dixon found five types of team knowledge transfer which she called *serial transfer, near transfer, far transfer, strategic transfer*, and *expert transfer*. She borrowed the labels *near* and *far* from learning theorists. The following is a summary of the types of knowledge transfer she found, which includes the definitions.

Table 1.0 Five Types of Knowledge transfer

	Serial Transfer	**Near Transfer**	**Far Transfer**	**Strategic Transfer**	**Expert Transfer**
Definition	The knowledge that a team has gained from doing its task in one setting is transferred to the next	Explicit knowledge that a team has gained from doing a frequent and repeated task is reused by other teams doing very	Tacit knowledge that a team has gained from doing a non routine task is made available to other teams doing similar	The collective knowledge of the organization is needed to accomplish a strategic task that occurs	A team facing a technical question beyond the scope of its own knowledge seeks the expertise of

	time that team does that task in a different setting.	similar work.	work in another part of the organization.	infrequently but is critical to the whole organization.	others in the organization.
Type of Knowledge	Tacit and Explicit	Explicit	Tacit	Tacit and Explicit	Explicit
Similarity of task and context	The receiving team (which is also the source team) does a similar task in a new context.	The receiving team does a task similar to that of the source team and in a similar context.	The receiving team does a task similar to that of the source team, but in a different context.	The receiving team does a task that affects the whole organization in a context different from that of the source team.	The receiving team does a different task from that of the source team, but in a similar context.
Design Guidelines	-Meetings are held often and are brief. -Everyone involved in the action participates in the meetings. -Meetings are facilitated locally.	-Knowledge is spread electronically, supplemented with personal interaction. -Knowledge is "pushed." -Brief descriptions are adequate.	-Exchange is reciprocal. -Source team knowledge is translated. -People carry the knowledge across the organization. -Process is given a recognizable name.	Knowledge needed is identified by senior-level -Knowledge specialists collect and interpret the knowledge. -Collection occurs in real-time rather than after the fact.	Electronic forums are segmented by topic. -Electronic forum are monitored and supported. -Differing levels of participation are encouraged. -Knowledge is "pulled."

Adapted from Nancy M. Dixon, *Common Knowledge: How companies Thrive by Sharing What They Know* (Boston: Harvard Business School Press, 2000), Table 8-1, pp144-145.

Although she has five transfers, Dixon's types of transfer talk to the four modes of knowledge creation as articulated by Nonaka (1994) discussed in the earlier section.

Looking across all five types of transfer, Dixon made three observations. First, everyone engaged in work tasks (not just experts) has knowledge that someone else in the organization can use to advantage. Secondly, knowledge is just as much embedded in communities such as

"Communities of Practice" as it is in individuals, and thirdly, knowledge is dynamic and ever-changing (Dixon, 2000).

Now that I have looked at the different ways knowledge can be transferred to others, the issue becomes when to use a certain type over the other. In a higher educational institution such as UCT, where learners take cross disciplinary classes, all types of knowledge transfer are applicable, although in different contexts.

To close this section, I am cognizant of two things: firstly, learning and transfer of knowledge is an interactive, ongoing, and dynamic process that cannot rest on the static body of knowledge; and secondly, that transfer is a learner-to-learner process where meaningful relationships precede sharing and transfer. Mindful of the preceding acknowledgement, I look at how people form meaningful social networks for knowledge sharing (see the section on Social Networks for knowledge sharing). However, before I discuss social networks I discuss the literature on learning in the next section.

2.3 Learning Transformation

Under this heading I look at forms of knowledge creation in the context of learning and knowledge sharing. I review literature on the nature of learning and how learning unfolds in an institutional setting. It should be noted that information systems research dealing with learning tend to do so with an organizational view. However, the findings are typically applicable at the individual learner level. Therefore, the literature I am drawing from in the following section tends to be mostly from organizational learning even though the thesis looks at learning from a learner's perspective.

2.3.1 Definitions of Learning

Similar to the case of knowledge, there are as many varied definitions of learning as there are disciplinary fields inquiring about the phenomena of learning. Below are some of the definitions:

> "the sign of learning is not a shift of response or performance as a consequence of a change in stimulus-situation or in motivation, but rather a shift in performance when the stimulus-situation and the motivation are essentially the same" (English and English,1958, p289).

This definition implies that learning occurs when an entity is able to respond differently to identical stimuli over time. It further seems to rule out strengthening of a response over time as an instance of learning. This definition also implies that learning should be difficult in ambiguous environments where stimuli are unclear and where action is necessary to create stimuli from which to learn. These implications lead Weick and Ashford (2001) to see English and English's definition as problematic.

Another definition is offered by Weiss (1990; p172) who said that:

> "Learning is a relatively permanent change in knowledge or skill produced by experience."

However, in a rapidly changing world, one may question whether the permanent learning suggested by this definition is crucial. Weick and Ashford (2001) question whether there could be instances where such permanence might be a hindrance rather than a benefit. In a widely cited definition, Duncan and Weiss (1979) proposed that:

> "...learning is the process within the organization by which knowledge about action-outcome relationships and the effect on the environment of these relationships is developed" (p84).

This definition, although from an organizational point of view, is attractive in that it highlights the theories of action and cause maps that are developed via a process of learning. Knowledge, rather than any particular action pattern (same or new), is the outcome of learning (Weick and Ashford, 2001). This suggests that inaction or continuing with the same action can be as much reflection of learning as are new actions (*op. cit.*, p706).

The three learning definitions discussed may be satisfactory, but they do not explain learning by way of socially interacting with others and contextual communication as a fundamental determinant. To fill in that gap, I accommodate Normann's (1985) suggestion that promoting awareness of culture within the organization increases the likelihood of subsequent learning.

2.3.2 Learning and Culture

To communication scholars, the culture perspective is relevant because culture has two very crucial functions in any institution. Firstly, it acts as a symbol and storage of past learning, and it works as an instrument to communicate this learning throughout the institution (Normann, 1985). Secondly, while culture changes continuously, it nevertheless represents the accepted ways of thinking and interpretation of reality, at any point in time (Weick and Ashford, 2001). Accordingly, culture consists of:

> "learned systems of meaning, communicated by means of natural language and other symbol systems, having representational,

> directive (task) and effective (socio-emotional) function, and capable of creating cultural entities and particular senses of reality" (D'Andrade, 1984; p116).

There are various and diverse ways of carrying the products of learning in the form of meanings, as is evident in Eisenberg and Goodall's (1993) description of culture:

> "A culture is full of itself. That is, its values (always competing) are performed and displayed everywhere – in symbols, language, stories, work routines...office artifacts, and corporate histories. Thus, culture is not something an organization has; it is something an organization is" (p143).

To connect the descriptions of culture to the learning subject, there is a need to emphasize that the culture perspective is less about what happens in people's heads and more about what happens between people and among their actions, practices, and narrative interpretations of practice (Weick and Ashford, 2001). Duncan and Weiss' definition of learning implies the importance of action from a cultural perspective. Eisenberg and Goodall (1993) make this definition clearer by suggesting that:

> "an action is an interpretation of a situation and it sums up the actor's place in it. Everything an individual does and says is an action. An action is, therefore, a strategic performance within a culture that has called for or shaped that performance in some way. It is a strategy for dealing with news of the day by using the interpretive tools the culture has provided, and it is a performance enacted within a particular situation or context that is constructed within that culture" (*op. cit.*, p136).

Actions therefore reflect an individual's learning. They may also serve as cues to others regarding appropriate experience. Thus, actions and cultures represent and promote learning. To highlight action and practice is to foreground know-how (knowledge-informed performance improvement, that is, practices, skills, and routines) and "know that" (knowledge acquisition) as central content for learning (Tetlock, 1991; p31). A focus on action and practice also legitimizes trial and error as a fundamental sequence in learning. Actions and practices are subject to the sequence trial-failure-learning-revision-retrial (Von Hippel and Tyre, 1993). The focus on action also explains the fact that learning could be successful as well as unsuccessful.

The discussions above further reiterate the importance of awareness of context by looking at action from a cultural perspective.

2.3.3 Learning and Cognition

Argyris and Schon (1978) explored the relationship between action and cognition in institutions and developed an action-oriented theory of learning. In line with the brain metaphor they saw institutions as cognitive artifacts. Central to their framework is the theory of action, conceived as cognitive structures underlying all deliberate human behaviour.

2.3.3.1 The Theory of Action

The Theory of Action is a set of norms, strategies and assumptions informing human conduct (Argyris and Schon, 1978). Typically, the theory of action consists of a set of interconnected propositions having an 'if...then' form. Theories of Action are influential structures characterized by an instrumental quality: in situation S, if you want to achieve

consequence C, under assumptions a...n, do A...(Argyris and Schon, 1978, p11). According to Argyris and Schon, an important problem in effective action is that theories of action which people actually use may differ from theories of action they espouse.

Theory in use is tacit in nature. In fact, theory in use reflects a set of assumptions, strategies, and norms which have deposited over time and have come to be taken for granted. That is, we act without being aware of the premises that govern our behaviour (Patriotta, 2003). Theory in use may remain tacit because people know more than they can tell (Polanyi, 1966). Having introduced the notion of theory of action as a guide to human behaviour, Argyris and Schon analyze how these theories are formed, how they come to change, and in what sense they may be considered adequate or inadequate. Their analysis led to the *theory of learning.*

2.3.3.2 The Theory of Learning

In the Theory of Learning, human action and human learning are placed in the larger context of knowing and are defined as the construction, testing and restructuring of a certain kind of knowledge. Argyris and Schon (1978) distinguish between two kinds of learning: single-loop learning and double-loop learning.

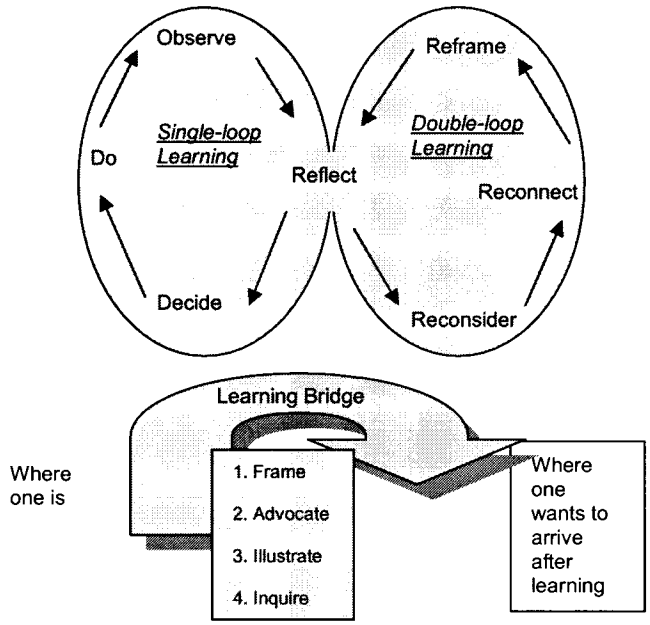

Fig. 8. Transformational Learning Illustrated (English & Baker, 2006)

In the single-loop, information is processed through the mind in four stages: observe, reflect, decide, and do. This type of learning is based on a simple feedback mechanism that links expected outcomes of action to the theory informing them in order to keep performance within the range set by institutional norms (Patriotta, 2003). The norms themselves remain unchanged. In this situation, learners respond to changes in the internal and external environments of the institution by detecting errors and correcting them within the existing theory in use.

Single-loop learning is effective for most of the day-to-day problems (*op. cit.*) that learners have to face. Most of our learning is based on our past. As new incoming information arrives at the mind, through the five senses, it is initially processed by the mind against a scan of short-term and long-term memory banks to find any matches in our past experiences (English & Baker, 2006).

Double-loop learning refers to circumstances where complex issues cannot be tackled by means of the individual's existing mental model of

the world. It enables better and faster learning as it opens up the individual's mental model. Each person's mental model traps them to interpret new information through paradigms formed from past experiences (*op. cit.*). In double-loop learning there is a process to reach a learning target, and that process is often re-visited until the target is successfully reached by re-visiting and questioning the initial assumptions.

The learners' mental models may, therefore, prejudice what is being perceived and, thus, be barriers to fast learning. Social interaction with other learners may therefore help overcome individual preconceptions. Hence, interaction is a strong argument for using groups to grasp and apply certain types of knowledge. Double-loop learning is the best way to escape the learner's mental model trap in order to transform learning. Referring to Figure 8, it is at the reflection stage that there is an opportunity to go into a second loop involving *reconsider, reconnect*, *reframe,* and back to *reflect,* allowing better and faster learning.

In transformational learning, that is to say, using single and double-loop learning, the bridge needs to be built to close the gap between where people are before learning and where they want to be after learning. The bridge needs to consist of the four keys (see Figure 8) to learning new knowledge, also thought of as principles (English & Baker, 2006). They are:

- *Frame.* Create a context for what is being presented. This is weaving knowledge into a bigger picture where it has more meaning. Rules, processes and patterns could also be context for learning.

- Advocate. When presenting new knowledge, advocating how it is going to benefit learners will make minds more receptive to learning.

- Illustrate. This involves telling a story, using a picture or diagram, a case inquiry, or analogy to bring the concept or knowledge to life.

- Inquire or demonstrate. This is to demonstrate or show how the knowledge may be used or applied for benefit. For knowledge reuse, this is powerful because demonstration shows an application of the knowledge.

Transformational learning is about the role that the mind plays in learning and the limitations that the individual's mental images present. In closing this section, it becomes evident that transformational learning ties well with social interaction, whose outcome is knowledge transformation, by validating the use of teamwork for many forms of learning.

2.3.4 Learning and Sense Making

Sense making literally means the making of sense (Weick 1995). It deals with how social agents construct meaning out of a flow of action and events and how this meaning is crystallized into sensible structures. Sense making keeps action and cognition together. Similar to knowledge, of which it represents the process aspect, sense making is closely related to action, contexts, and time. Sense making is an ongoing activity related to how people cope with equivocal flows of action (Patriotta, 2003).

The cognitive content of action emerges only in specific occasions, namely, when action and cognition are set apart. Louis and Sutton (1991)

provide a valuable overview of occasions for sense making. That is, situations for conscious cognitive processing, when people shift from automatic to active thinking. The authors identify three kinds of situations in which actors are likely to become consciously engaged:

i) Switching to a conscious mode is provoked when one experiences a situation as unusual or novel. That is, when something 'stands out of the ordinary', 'is unique', or when the 'unfamiliar' or 'previously unknown' is experienced.

ii) Switching is provoked by discrepancy. That is, when 'acts are in some way frustrated', when there is 'an unexpected failure', 'a disruption', 'a troublesome...situation', when there is a significant difference between expectations and reality.

iii) A third situation is that of deliberate initiative, usually in response to an internal or external request for an increased level of conscious attention – as when people are 'asked to think' or 'explicitly questioned' or when they choose to 'try something new' (Louis and Sutton, 1991, p60)

According to Patriotta (2003), interruption is a common antecedent of sense making occasions, although the mere presence of discontinuities in action is not sufficient. The sense maker is an active agent, and realities and environments are 'enacted' by the actors who face them through processes of selection, punctuation, and retention (Weick, 1977). In other words, occasions for sense making are themselves constructed, after which they become a platform for further construction.

Contexts for sense making and the act of interpretation are of importance. An action can become an object of attention only after it has occurred, and

the choice of what the action means is heavily influenced by the situational context (Weick, 1995, p26). As a result, context affects both the process of noticing (Starbuck and Milliken, 1988) and the interpretation of what is noticed. It defines the scope and meaning of action (Patriotta, 2003).

Given the 'ghostly' nature of knowledge, it is always challenging to empirically derive specific actions and decisions from internal (invisible) representations of actors. Consequently, the problem of studying knowledge empirically remains a challenge (*op. cit.*). The sense making perspective seems to close the gap between theory and practice, and therefore provides the conceptual basis for an empirical inquiry about knowledge. It recognizes the cognitive dimension while taking into account the importance of meaning and context.

2.3.5 Summary on the nature of learning

I have discussed the dynamics and nature of learning, making culture and action central to the description and definition of learning. In this section I conclude the learning discussion by giving a summary of the nature of individual learning.

One attribute of individual learning is that it is primarily a controlled, mindful activity that is supplemented by tacit knowledge acquisition and operant situationing (Weick and Ashford, 2001). This blend of learning mechanism was implied earlier in Normann's (1985) argument that "an interest in culture is really an interest in learning." He refers to an interest in culture as "understanding and making conscious" learning that has taken place. He also refers to "awareness" of culture as a precursor to learning. The essence of learning seems to be its conscious nature.

Individuals monitor their environments, interpret what they see and formulate experience, all with some degree of consciousness regarding what they are doing (Weick and Ashford, 2001). What this observation implies is that to learn, individuals need to know that there is a need for learning. They also need to have a sense of what capabilities they have and what kind of environment they face. In other words, learners need to know who they are, what kind of situation they are in, and that there is a need for learning and possibly change or adaptation. For example, learners need to be aware of dimensions along which they will be evaluated. With this awareness, they may be able to see cues suggesting that some change in their personal style or behaviour would make their learning to be more effective or acceptable.

Even though substantial individual learning is primarily mindful, there is evidence that knowledge is also picked up tacitly, as a by-product of experience (Wagner and Sternberg, 1985). Knowledge gained via implicit learning tends to be more complex; it is not fully accessible to consciousness; and the act of learning does not involve processes of conscious hypothesis testing (Seger, 1994). As an example, Ashford and Black's (1996) study on newcomers suggests that individuals learn, for the most part, through conversations. Although learning is often not the explicit goal of these interactions, it is a very important by-product. Tacit learning that goes on during interactions between individuals is an example that suggests an important connection between learning and communication that involves the transmittal of tacit knowledge and the act of implicit learning (Weick and Ashford, 2001).

Another observation on how individuals learn is that activity often paves the way for thinking. One of the things that learners are conscious about is their own and other's activities, so that one can learn by seeing what they do. This observation, according to Weick and Ashford, suggests that

contexts that offer individuals room to experiment, free from potential stigma, should promote learning. This follows the idea that people learn by doing. That is, individuals can learn by examining their own actions – which suggests that learning involves a situational understanding and a self-understanding.

Individual learning is also dependent on cues, and it is this dependency that brings communication into discussions of learning. Individuals who are aware of the need for learning can learn by explicitly attending to cues offered by and punctuated from the environment regarding demands, requirements, and opportunities (Weick and Ashford, 2001). Such attention gives the learner a sense of what ought to be done. To learn how adequate their routines and practices are, individuals also need to attend to feedback cues offered by the environment (*op. cit.*). Such cues will suggest whether an individual learner is moving toward success or failure. These cues, according to Ashford (1993), range from direct – e.g., someone provides the learner with an assessment – to indirect, where actions are interpreted as feedback occur. The cues may also be positive or negative.

In analyzing the environment for cues regarding what the individual should be doing and how well it has been done, Ashford's (1986) research on self assessment suggests three assessments about any available cue. Firstly, he suggests that the learner asks whether an event, action, subtle gesture, etc., are cues. Secondly, the learner should ask whether the cue is meant for him or her, and lastly the learner should ask what the cue means.

On the other hand, Bandura (1986) suggests that individuals can use the actions of others as cues from which they learn explicitly. By watching what happens to individuals when they engage in different behavioural

patterns, the learner comes to understand that a certain strategy leads to success while another leads to failure, without engaging in either strategy personally. In cases where neither the environmental cues nor cues from models are available, learners can still resort to proactive action to obtain information and can create cues by trial and error (Weick and Ashford, 2001).

The preceding section discussed and addressed the issue of learning, meaning and interpretation of action. In the thesis, learning action and knowledge action are synonymous. Therefore, the discussions have further informed me about the essentials for the construction of knowledge and how that knowledge may transform. The following section discusses how teams or groups are formed for purposes of learning and sharing knowledge through social networks.

2.4 Social Networks for Knowledge

Social networks or communication networks are the patterns of contact between partners that are created by transmitting and exchanging messages through time and space (Monge and Contractor, 2001) in order to transfer and share knowledge. In this section I examine the theoretical mechanisms that theorists and researchers have proposed to explain the creation, maintenance, and ending of these diverse networks.

Communication network linkages are created when one or more communication relations are applied to a set of people or groups. For example, in an organizational context, Farace, Monge, and Russell (1977) identified three communication networks in terms of production, maintenance, and innovation linkages.

Since I would like to concern myself with network linkages that facilitate knowledge transfer and sharing, I turn to Badaracco's book, *The Knowledge Link*. In this book Badaracco (1991) identifies two types of knowledge, which he calls migratory and embedded, each associated with a different type of linkage. Migratory knowledge is that information that exists in forms that are easily moved from one location, person, group, or firm to another. This knowledge tends to be contained in books, designs, machines, computer programs, and the individual mind, all of which encapsulate the knowledge that went into its creation.

Embedded knowledge is more difficult to transfer. It "resides primarily in specialized relationships among individuals and groups and in the particular norms, attitudes, information flows, and ways of making decisions that shape their dealings with each other" (Badaracco, 1991, p79). The two types of network linkages he identified are the product link, associated with migratory knowledge, and the knowledge link, associated with embedded knowledge (*op. cit.,* p11-12). Knowledge links in the context of this thesis could be thought of as alliances whereby learners seek to learn and jointly create new knowledge.

Table 2.0 Typical Social Network Measures of Links

Measure	**Definition**	**Example**
Indirect links	Path between two actors is mediated by one or the other	A is linked to B, B is linked to C; thus A is indirectly linked to C through B
Frequently	How many times, or how often the link occurs	A talks to B 10 times per week
Stability	Existence of link over time	A has been friends with B for 5 years
Multiplexity	Extent to which two actors are linked together by more than one relationship	A and B are friends, they seek out each other for advice, and work together
Strength	Amount of time, emotional intensity,	A and B are close friends, or spend much

	intimacy, or reciprocal services (frequency or multiplexity often used as measure of strength of tie)	time together
Direction	Extent to which link is from one actor to another	Work flows from A to B, but not from B to A
Symmetry	Extent to which relationship is bi-directional	A asks B for advice, and B asks A for advice

(Brass, 1995, p44)

From measures of social network ties, Brass (1995) then identifies other aspects tied to individual participants (actors). For example, the extent to which participants can reach all the others in the network (i.e., the degree, the closeness, and 'betweenness', etc.).

2.4.1 Theoretical Explanation of Social Network Formation

The following section reviews a number of theories that throw light on the issue of network formation. In some cases, different theories offer similar explanation but at different levels of analysis. There are several theories that relate to emergence of communication networks; the review in this section picks up those that may be applied to the learning environment. To my knowledge, there have not been interpretive studies of social or communication networks, hence I draw from some positivist studies. Although positivist in nature, certain aspects of the theories and literature on social network formation are applicable to this interpretive research.

2.4.1.1 Theory of Homophily

The theory of homophily suggests that there is a stronger tendency to form social ties with others who are regarded as similar, than there is a tendency to form ties with others who are regarded as different

(Hanneman and Riddle, 2005). It has been used by researchers in an attempt to explain communication networks. According to Brass (1995), similarity is thought to ease communication, increase predictability of behaviour, and foster trust and reciprocity. Studies in homophily has been on the basis of age (e.g., Carley, 1991; Coleman, 1961), gender (Ibarra, 1993), education, occupation and social class (Ibarra, 1995; Marsden, 1988). The reasoning behind the theory of homophily generally falls into two categories: the similarity-attraction premise (Byrne, 1971) and the premise of self-categorization (Turner, 1987).

The similarity-attraction premise posits that homophily reduces the psychological discomfort that may arise from cognitive or emotional inconsistency, and that individuals are more likely to select similar others because by doing so they reduce the potential areas of conflict in the relationship. The self-categorization premise suggests that individuals define their social identity through a process of self-categorization during which they classify themselves and others using categories such as race, age, gender. Schachter (1959) argued that similarity provided individuals with a basis for legitimizing their own social identity. The manner in which individuals categorize themselves influences the extent to which they associate with others who are seen as falling into the same category (Monge and Contractor, 2001).

Several studies have concentrated specifically on gender homophily. For example, Leenders (1996) revealed that gender was a more influential predictor of enduring friendship ties and communication networks than proximity. Ibarra (1992) revealed, in her research of an advertising agency, that even though women reported task-related communication and advice influence ties with men, they were more likely to select other women in their social support and friendship networks. Men, on the other hand, were more likely to have instrumental and non-instrumental ties with

other men. However, Crombie and Birley (1992) found that while women tended to rely on both men and women for advice, men consulted largely with other men.

Communication scholars have consistently found an interest in the principle of homophily as a theoretical mechanism to explain the evolvement of social networks. This principle will be used in this inquiry as a network mechanism relevant in the social comparison processes used by learners to make assessment, for instance, about who they choose to interact with or consult for knowledge transfer and sharing.

2.4.1.2 Theory of Physical and Electronic Proximity

Researchers have also sought to explain communication networks on the basis of physical or electronic propinquity, e.g., Corman (1990), Johnson (1992) and Rice (1993). Proximity facilitates the chances of communication by increasing the probability that individuals will meet and interact. The social interaction would then allow individuals the opportunity to explore the extent to which they have common interests and shared beliefs (knowledge).

Early research in organizational settings indicated that the frequency of face-to-face dyadic communication drops sharply after the first 75 - 100 feet (Conrath, 1973; Allen, 1970). Zhan's (1991) more recent research also demonstrated that increased physical distance between offices, chain of command, and status led to decreased probability of communication. Furthermore, Rice (1993) observes that physical proximity may also facilitate interaction by exposing spatially co-located individuals to the same ambient stimuli. Informed by this theory, I argue that learners who see each other often, that is, take the same classes or are in the same department, etc., are more likely to share knowledge with each other.

2.4.1.3 Social Support Theory

A social support explanation is based on the ways in which communication networks help members cope with stress, and its effect on mental well-being. Interest in social support networks can be traced back to Durkheim's (1977; original work was in 1897) groundbreaking work on the impact of solidarity and social integration on mental health. To explain how social networks guard the effect of stress, two general mechanisms exist. Firstly, an individual in a dense social support network is offered increased social support in the form of resources and sociability (Lin and Ensel, 1989). Secondly, in less dense social circles (networks in which membership is based on common characteristics or interests) social support networks can help provide support by leading members to a better understanding of their problem, being a resource for help, or mobilizing resources (Kadushin, 1983).

The explanations of network formations and the subsequent review of theories have thrown light on how and why learners may have social networks. The social networks exist to leverage learning problems, where a learner cannot cope in isolation. The theory of homophily explains who learners are likely to interact with, theories of proximity explain the chances for interaction, and social support theories explain the way network members are helped to cope with stress. In the mobile learning environment, the social support network is viewed as a flow and provision of resources among learners to decrease the level of stress created by learning situations or to help the individual learner cope with learning activity stress.

At this point, I move to discuss where social networks are applicable and how and where learning experiences take place. Since the thesis is about mobile learning environments I unpack contexts and environments in the next section.

2.5 Context

The theory of knowledge cannot be divorced from the situations (context or environment) under which knowledge and learning experiences take place. In this section I look at how researchers have described *context* in their various works.

2.5.1 Definitions of Context

Context is one of the most dynamically used terms in a variety of research disciplines, most of which define context differently. The miscellaneous definitions include:

- Context as location, identities of nearby people and objects, as well as changes to those objects (Schilit and Theimer, 1994).

- Context as location, identities of the people around the user, the time of day, season, temperature, etc. (Brown et al., 1997).

- Context as the user's location, environment, identity and time (Ryan et al., 1997)
- Context as the user's emotional state, focus of attention, location and orientation, date and time, objects, and people in the user's environment (Dey, 1998).

Scholars like Schilit et al. (1994) argue that the important aspects of context are: where you are, who you are with, and what resources are nearby. They define context to be the constantly changing execution environment where the execution environments are in three folds:

Computing environment – e.g., available processors, devices accessible for user input and display, network capacity, connectivity and costs of computing.

User environment – e.g., location, collection of nearby people, and social situation.

Physical environment – e.g., lighting and noise levels.

While Dey et al. (1999) define context to be the user's physical, social, emotional or informational state, Pascoe (1998) defines it to be the subset of physical and conceptual states of interest to a particular entity. These definitions are too specific, according to Dey and Abowd (1999). They argue that in some cases, physical environment may also be important while in others it may be completely immaterial.

2.5.2 Environments as Context

Educational institutions and learners survive by making sense of and giving sense to their environments. They acquire and interpret flows of environmental information so that they are prepared for opportunities or effectively manage interdependencies with resource regulators and other important stakeholders. In this section I briefly discuss key perspectives on the environment and conclude the section with environments where learning happens – learning environments.

Key Perspectives on Environment

In this section I discuss the key perspectives on environment, drawing from the organizational research point of view. Although the thesis is

about learners and not the University of Cape Town as an organization, the organizational perspective still throws light on how environments are understood and interpreted at the individual learner level.

2.5.2.1 Objectivist perspectives

The environment has been portrayed as a source of resources or as a source of information. The resource dependence perspective developed by scholars like Aldrich and Pfeffer (1976), and Pfeffer & Salancik (1978) treats the environment as consisting of scarce resources which are competed for by different organizations. Scholars adopting the resource dependence approach pay less attention to the processes by which organizations either obtain information about the environment or communicate information about the environment. They pay close attention, however, to characteristics or dimensions of task environment (Sutcliffe, 2001).

Characteristics or dimensions describing task environments include a set of components (e.g., economic, regulatory, technical, social), stakeholders (e.g. learners, teachers), or a set of attributes (e.g., instability, complexity, munificence) (Aldrich, 1979). The characterization of the environment as components, stakeholders, or attributes is often referred to as the "objective environment." The idea of objective environment supposes that organizations are embedded within an external independent environment that "constitute(s) something or some set of forces to be adapted to, co-aligned with, controlled, or controlled by" (Smircich & Stubbart, 1985, p725). Conceptualizing environments as objective, concrete, external, or tangible implies that attributes, events and processes are hard, measurable, and determinant. It follows then that in an objective environment, the goal is to initiate strategic actions that will meet the real constraints and demands that exists "out there" (*ibid.*, 1985, p726).

2.5.2.2 Perceptual and Interpretive Perspectives

Environments have also been characterized as a source of data that serves as the raw material from which organizational members fabricate information and subsequent organizational experience. In this perspective – also known as the information-processing perspective – scholars are concerned with the situations under which information is noticed and how it is communicated and interpreted (Sutcliffe, 2001). Viewing the environment as flows of data and information illuminates the importance of perceptions and interpretations. The perceptual perspective on environments is similar to the objectivist perspective in that it also assumes that there is a real, material, external environment out there to be perceived (Smircich & Stubbart, 1985).

There is, fundamentally, little difference between the conception of objective and perceived environments. The focus of the interpretive view is primarily on how information processing – that is, the interpretation of information – is influenced by factors unique to the context such as communication processes and the social psychological characteristics of learners.

2.5.2.3 Enactment Perspective

The enactment or social construction perspective suggests that the environment is not an objective given; it is not even perceived. Rather, the environment is either made or enacted (Weick, 1977). The central premise of the enactment perspective is that organizations create the environments that subsequently impinge on them (Abolafia & Kilduff, 1988). Enacted environments are socially created rather than concrete or material in that the environment is the joint product of the actions of purposeful actors and accompanying efforts to make sense of these

actions (*op. cit.*). Enactment transpires through communication processes in that entities involved in interactive relationships read each other's behaviour and make attributions to make sense of the situation (Smircich & Stubbart, 1985).

"An enacted model implies that an environment of which strategists can make sense has been put there by strategists' patterns of action – not by a process of perceiving the environment, but a process of making the environment" (Smircich & Stubbart, 1985: p727). Enactment occurs through the processes of attention and action. The product of enactment is not an accident or an afterthought, but rather is an orderly, material, social construction that is subject to multiple interpretations (Weick, 1988).

2.6 Learning Environments

The focus in this section is to define learning environments with which the University of Cape Town may be associated. Knowledge construction and approaches to learning need to be seen and understood in relation to the learning environment. The nature of a learning environment is the underlying argument that learning and knowledge transformation takes place in an array of places and formats, and involves several agents, tools and media. For example, networked learning environments are perceived to promote learner autonomy; accordingly, "a new learning environment is a holistic and integrated environment with the goal of promoting opportunities for lifelong learning and individual study" (Pohjonen, 1997: p370).

2.6.1 Definition of a learning environment

Many definitions of a learning environment exist since what constitutes a learning environment can be argued differently depending on the person. With the emergence of computers, there has been a shift in emphasis from learning within a fixed localized boundary to a broader perspective about where learning takes place.

A learning environment can be thought of as a digital platform with communication and information tools; it can be taken to mean the physical environment (classroom, library, desk in residence, etc.) in which the learner learns; or it could refer to the many different social and cultural systems that surround a learning experience for an individual (Collis and Gommer, 2001). As a result of the broader perspective about where learning takes place, new concepts about the locality and the mode of learning, such as open or flexible learning and networked learning environments, have emerged (Tiffin and Rajasingham, 1995).

2.6.2 Networked learning environment

Jacobson and Levin (1995) describe networked learning environments as "knowledge spaces that can be criss-crossed or explored for different purposes and from different conceptual perspectives, with different learning possibilities afforded by each traversal." They further divide knowledge into four categories: public knowledge, collaborative knowledge, shared personal knowledge and experiential knowledge.

Pohjonen (1997) differentiates between four different types of networked learning environments: the real-time encounter model, the simultaneously distributed learning model, the independent inquiry model, and the time-independent learning model. These four environments differ in terms of

locality and time. In fact, the new learning environments are rarely constructed on a single model of action, that is, "they usually have simultaneous features of all the four basic models with the main emphasis on different aspects" (Pohjonen, 1997; p371). Fraser (1986) touches on the locality of learning in terms of classroom-level environments and institution-level environments.

The characteristic of networked learning environments is the belief that they require dynamic interaction with the learner, and therefore increased learner responsibility and autonomy (Diercks-O'Brien, 2000). Dynamic and interactive environments need to be flexible with regard to learning styles and learning routes.

2.6.3 Mobile Learning Environment

In the thesis a mobile learning environment is defined as any location where ubiquitous learning and knowledge transformation happens while the learner traverses the three learning contexts (described in the problem formulation). That is, it is any learning environment that supports the mobility of a learner.

The premise for sharing learning experiences and the interactive space for knowledge sharing include the following three arguments:

i) The knowledge transformation and learning experience depend on the awareness of learning and the knowledge environment as perceived by the learner.

ii) The mobile learning environment includes all possible aspects of, and factors that can have an influence on, the learning and sharing

of experiences. The approach to the mobile learning environment is holistic.

iii) The mobile learning environment is dynamic in nature and the quality of the learning and knowledge sharing experience depends on the level and nature of interaction between learners and between learners and the learning environment.

In the following section I discuss how environmental information is noticed, the factors influencing the interpretation of environmental information and how the environment changes over time – where a learner's use of information and communication subsequently reshapes the environment.

2.6.4 How Environments Become Noticed

In this section I review research studies of how institutions and their learners come to know and cope with their environments through the processes of attention, interpretation, and action. These studies viewed their research problems from either a perceptual, interpretive or enactment perspective.

2.6.4.1 Noticing environmental information

To cope well with the environment, it is imperative that learners notice environmental data and information. Although noticing the information and available social support is one key step to coping with environments, it is not the only important process. In other words, information noticed is not inherently meaningful – how it is interpreted is an equally essential process (Sutcliffe, 2001).

I use the term *noticing* to refer to both an awareness of information and available social support. The process of noticing is both formal and informal. Interpreting would then refer to the process of making sense of what is noticed. This process has a number of distinct aspects including "comprehending, understanding, explaining, attributing, extrapolating, and predicting" (Starbuck and Milliken, 1988, p51). Communication is very important to this process as meanings are shaped through advocacy, persuasion, and other power and influence processes (Sutcliffe, 2001).

All in all, environments become known through the process of noticing and interpreting. Communication dynamics are critical to both noticing and interpreting. These are enhanced by the learners' ability and willingness to share as well as their abilities to resolve conflicts. Communication and the media used in communication are equally important in the noticing and interpreting processes (*op. cit.*).

The purpose of the preceding section was to explore environments and learning environments with the intention of highlighting and understanding issues that may concern environments where learning activities happen. In the research study, I maintain an ultimate focus on aspects of learning environments where learners are mobile. The focus is on the social environment as well as the different social and cultural systems that may surround an anytime, anywhere learning experience for a learner. In the research, all the aspects describing an environment are brought together and seen as a mobile learning environment. The inquiry is on the extent to which mobile learners use social awareness to re-shape their knowledge in a learning environment. Having an understanding of environments and how they are interpreted I now seek to understand how culture manifest as context for interaction in those environments. This is discussed in the next section.

2.7 Culture as Context

In this section I seek to understand the significance of the way people communicate as a function of their culture. I start by looking at culture as a communicative practice.

2.7.1 Culture as Communicative Practice

When researchers approach culture as communicative practice, they are mostly interested in the constitutive role of communication in shaping institutional experience and action. Culture is grounded materially in day-to-day communication activity that cannot be separated from the institution (Stohl, 2001). Institutions emerge from the collective, interactive processes of generating and interpreting messages and creating networks of understanding through a matrix of coordinated activities and the ongoing relationships among the subjective and emotional experiences of its members (Stohl, 1995).

Culture and communication are entangled and communally attached. Culture becomes public in the meanings people construct in communicative activity. Hall (1959) even goes on to argue that "culture is communication and communication is culture." He distinguishes four communicative or cultural domains that help organize this distinct literature:

1) Time (a "silent language" that "speaks more plainly than words"),

2) Context (the information that surrounds the interpretation of an event)

3) Space (a "hidden dimension" that results in people of different cultures inhabiting different sensory worlds)

4) Language (issues related to multilingualism and the possible choice of one working language).

Below, I briefly unpack each domain.

2.7.1.1 Time

The terms *monochronic* and *polychronic* have been used to capture the ways in which tempo, rhythm, synchrony, scheduling, lead time, and the rate of information flow become institutional instantiations of culture (Hall & Hall, 1987, 1990). In monochronic cultures, time is conceived as material, linear, and substantial so that the focus is on punctuality and deadlines. The day is scheduled so that people deal with one thing at a time. In polychronic cultures, time is nonlinear and insubstantial. Meetings or activities are not rigidly scheduled in a linear fashion, and this allows people to be involved with many things at once. There is less pressure related to deadlines.

2.7.1.2 Context

"Context-ing" reflects the types of messages people create, desire, and understand (Hall, 1976). Some cultures are distinguished by highly interconnected and extensive communication networks and operate as high-context message producers where information spreads rapidly and is fairly uncontrolled. A high-context message is one in which most of the information is already in the person and the relationship while very little is in the coded, explicit part of the message (Stohl, 2001).

Cultures with segmented networks are low-context message producers; information is highly focused, compartmentalized, and controlled. Low-context cultures tend to separate personal relationships from work relationships; the mass of the information is vested in the explicit code, not in the relationships. Accordingly, each time people interact with others they expect and need detailed information (*op. cit.*).

2.7.1.3 Space

As a hidden dimension of communication, space instantiates the structure of experience as it is molded by culture. From this outlook, the spatial and social aspects of a phenomenon are inseparable; space is not just occupied, it is lived and instilled with meaning (Dear and Wolch, 1989). Scholars often take the meaning-centered approach focusing attention on how space is not only constructed and represented but how it reproduces meanings and power relations across cultural contexts. For these scholars, communication is not representational, it constitutes knowledge and truth – discourse articulates identity, communication constitutes culture (Stohl, 2001).

2.7.1.4 Language

Rationales for a "one language" policy include arguments based on instrumental efficiency and interpersonal effectiveness. It is argued that having one official language eliminates the need for costly and time-consuming translation in both written and oral communication, and minimizes cycle time and awkwardness of interaction (Altman, 1989). The prevalence of one language, according to Chan's (1995) argument, builds social cohesion and trust, allows people to do their jobs better, and makes the environment safer. However, the importance of language choice is far more important. For example, when people are asked to comment on

other languages, they most often comment on their perception of the other cultures. From the perspective of culture as communicative practice, the pragmatic of an official institutional language not only has instrumental effects but enacts who and what is respected, validates certain types of knowledge claims, and creates expertise and privilege (Berns, 1992).

In a mobile learning environment, learners either interact face-to-face or mediate their interaction through the use of mobile technologies. In the next section I look at how mobile learners may mediate their social interaction for purposes of knowledge transformation. This is achieved through a discussion of mediated interaction and the theory of media communication.

2.8 Mediated Interaction

Interaction across proximity and distance is a natural quality of modern day life. The concept of mediation can be connected with the common objectivity of representational meaning in time and space. Mediation is a direct and necessary activity between different kinds of activity and consciousness (Williams, 1976). Technological mediation is verbal and symbolic, and involves representation and inscription into the world. Mediation translates and converts. The power of mediation derives from actions at distance which invade the social world (Rasmussen, 1996).

2.8.1 Mediation of Social Life through Communication Technology

Communication scholars look at technologies as both social constructs and artifacts. Communication technology has structural impact on social and cultural processes and on our everyday life. It is, therefore, important to establish the significance of communication technologies in the

changing relationships between the individual and the rest of society. Communication technologies exercise power at both the individual level and the societal level – in their ability to extend and enforce human action and to mediate social and cultural meaning in time and space (Rasmussen, 1996). It goes without saying then that we should attempt to understand the present social significance of communication technologies for social action and social change.

Communication technologies, such as mobile devices, reproduce and are themselves products of a process involving two interrelated interventions: a) intervention of everyday life and its technology, and b) technical intervention through the expansion of technical infrastructure in the form of networks which give access to services, information and communication (Rasmussen, 1996). When humans interact with technology, they engage with the material and symbolic properties of the technology (Orlikowski, 2000).

2.8.2 Methodological Approaches to Communication Technologies

The meaning of communication technologies is partly reproduced through the interaction that activates it (Rasmussen, 1996). In other words, content reproduces technology and the message reproduces medium. In understanding this argument, hermeneutically, Rasmussen posits that everyday use and the outcome of such use, is a definitional process which reproduces and modifies the conception of various modes of communication technology as media.

Firstly, Rasmussen claims that the use itself is a situation for a meaningful conception of communication technology. Without use, communication technology becomes reduced to objects with only symbolic meaning (e.g.,

symbols of affluence, abundance, or technological change) but without meaning as media. Secondly, he posits that practical and reflexive use creates experiences which in turn modify use and lead to technical modifications over time. Thirdly, he argues that the activation of communication technology mobilizes social rules (norms, values, language) and resources which have intended and unintended consequences for social relationships.

People's technology-mediated practices, their practical and reflexive *modi operandi* of tools in and through their everyday contexts, account for the construction of meaning in mediated communication. Accordingly, the use of technology no longer merely takes place in contexts, they create contexts. The medium is the context of interaction, connecting itself in complex ways with bodily places (Rasmussen, 1996).

Rasmussen's views are shared by Orlikowski (2000) who asserts that viewing the use of technology as a process of enactment enables a deeper understanding of the role of social practices in the ongoing use and change of technologies. To examine how people enact structures which shape their emergent and situated use of technology, Orlikowski proposed a structurational perspective on technology. Her perspective, informed by Giddens' Structuration Theory (1979), offers a practice-oriented understanding of the recursive interaction between people, technologies, and social action.

Interaction mediated by communication technologies takes place among individuals situated in different institutions localized in an extended space. In this approach, studies of the flow of communication between social institutions through the actual technological mode and the possible social (knowledge) transformation that such flow stems from or constitutes, are relevant (Rasmussen, 1996). He uses the term *social institution* to mean

relatively stable groups of people involved in durable communication processes. Consequently, social institutions – like relatively stable groups of learners at the University of Cape Town – constitute social systems.

2.8.3 Media Theory

Whereas the relative strength of media theory (Meyrowitz,1986, 1994) lies in stressing the relation between cultural change and the technological aspects of dominant media, its relative weakness lies in the underdeveloped view on human agents and their ability to pragmatically use, incorporate and 'embody' media in everyday life (Rasmussen, 1996). Media theory tends to overlook aspects of the media environment which are not directly connected to the structure of the media, such as media content and media institutions. The theory ignores individual and collective social action and the capability to use particular media for particular purposes. Media theory, consequently, does not provide a comprehensive theory of the *social* (*op. cit.*).

In a mobile learning environment, learners mostly interact with others who are not in the same location through the use of mobile technologies. In the preceding sections, I highlighted the theories of mediated interaction. This research is not about how learners use technology to interact with others, hence the Media Theory and communication technologies were only succinctly discussed. In the research, where learners use social awareness to socially interact with others, communication technologies become the context of interaction. Accordingly, the use of technology no longer simply takes place in contexts, they create contexts of interaction.

2.9 Conclusion of Chapter Two

Chapter two laid out the ontological and epistemological foundations of the inquiry, systematically reviewing the existing literature to inform the conceptualizing of the thesis. The thesis is ultimately about environments that support learning and knowledge transformations. Consequently, I looked at knowledge as a multifaceted phenomenon – examining how knowledge is created, transferred and subsequently transformed.

In the research, learning and knowledge transformation are synonymous. Therefore, I discussed and examined literature on learning concepts and learning environments to inform my understanding of environments where context and culture is interpreted to facilitate learning and provide knowledge transforming environments. I discussed settings that sustain knowledge and learning – why and how social networks are formed to support knowledge transformation. In the next chapter, I discuss the research approach and the underpinning theories of the research.

CHAPTER THREE: RESEARCH APPROACH

3.1 Introduction

This chapter discusses the research approach followed in the thesis. The research approach is a philosophical and theoretical framework that guides the research. In the following sections I discuss the various epistemological and ontological views adopted and employed in information systems research followed by the reason for the choice taken in this inquiry. The chapter has three main parts: approaches to information systems research, rationale for the approach chosen, and lastly the underpinning theories.

3.2 Approaches to Information Systems Research

This section discusses the alternative paradigmatic perspectives suitable for use in Information Systems research. Firstly, I highlight various research methods common and typically employed in the IS field and lastly I highlight the justifications for embarking on a case study and for following the interpretive research paradigm.

Compared to the more established disciplines like Sociology, Chemistry, Mathematics and Physics, the Information Systems (IS) discipline is fairly young. IS research is multidisciplinary and tends to draw from three core areas: General Systems Theory, Computer Science and social and behavioural science (Checkland and Howell, 1998). The different approaches to IS research are outlined below.

3.2.1 Qualitative Research

The inquiry follows a qualitative research method. Qualitative research involves the use of qualitative data, such as interviews, documents, and participant observation data, to understand and explain social phenomena. In Information Systems, there has been a general shift in IS research away from technological to managerial and organizational issues, hence an interest in the application of qualitative research methods (Myers, 1997). Myers further asserts that the motivation for doing qualitative research, as opposed to quantitative research, comes from the observation that if there is one thing that distinguishes humans from the natural world, it is our ability to talk.

Qualitative research methods are designed to help researchers understand people and the social as well as cultural contexts within which they live. The goal of understanding a phenomenon from the point of view of the participants and the particular social and institutional context is largely lost when textual data are quantified (Kaplan and Maxwell, 1994). Although this research follows an interpretive research paradigm as the underlying epistemology, qualitative research could either be positivist or interpretivist. The two paradigms and the context are described below.

3.2.2 Positivist Approach

During the formative years of IS, the positivist paradigm clearly dominated IS research partly due to the strong positivistic leanings of the top journals in the discipline such as *MIS Quarterly* and *Information Systems Research* (Mingers, 2003). Positivists generally assume that reality is objectively given and can be described by measurable properties which are independent of the observer (researcher) and his or her instruments (Orlikowski and Baroudi, 1991). Positivist studies generally attempt to test

a theory in an attempt to amplify the predictive understanding of phenomena. In accordance with this, Orlikowski and Baroudi (1991) classified IS research as positivist if there was evidence of formal propositions, quantifiable measures of variables, hypothesis testing, and the drawing of inferences about a phenomenon from the sample to a stated population. In the positivist approach, reality tends to be seen as not complex and is rather seen as yielding easily to statistical deduction. The positivist approach is not employed in this research.

3.2.3 Interpretive Approach

The positivist approach has been criticized for its failure to take into account the fact that the social world is constructed through meanings and that it is a social practice (Lamprecht, 1997). With 'meaning' at the core of the IS field, work in that field has to be done outside any belief that there is the possibility of a static social world 'out there' (Checkland and Howell, 1998). Given this critique of positivism, interpretivism has been recognized as a more appropriate paradigm for IS research (Klein and Myers, 1999).

The philosophical base of interpretive research is hermeneutics and phenomenology (Boland, 1985). Interpretive studies generally attempt to understand phenomena through the meanings that people assign to them and interpretive methods of research in IS are aimed at producing an understanding of the information system, and the process whereby the information system influences and is influenced by the context (Walsham, 1995a). Interpretive research does not predetermine dependent and independent variables, but focuses on the full complexity of human sense making as the situation emerges (Kaplan & Maxwell, 1994). Interpretive research is further discussed in section 3.6.

3.2.4 Critical Approach

IS research may be classified as critical if its main task is seen as being one of social critique, whereby the restrictive and alienating situations of the *status quo* are brought to light (Klein and Myers, 1999). In critical research, the investigation is classified as emancipative if it aims to help eliminate the causes of unwarranted alienation and domination, and thereby enhance the opportunities for the realization of human potential (Hirschheim and Klein, 1994). Critical theorists assume that people can consciously act to change their social and economic situations.

3.3 Rationale for Interpretive and Case Study approach

Although there are numerous types of case studies adopted in Information Systems research, Yin (1993) discusses three types: exploratory, causal and descriptive case studies. In an Exploratory case study, the collection of data may occur before theories or specific research questions are formulated. This is followed by analysis of data and leads to more complete case studies. In this type of case study, the first step is to define the issues to be researched. The Causal case study looks for cause-and-effect relationships while searching for explanatory theories of the phenomena. The Descriptive case study requires a theory to guide the collection of data. Accordingly, "this theory should be openly stated in advance and be the subject of review and debate and later serve as the design for the descriptive case inquiry. The more thoughtful the theory, the better the descriptive case inquiry will be" (Yin, 1993, p22).

Where the experience of the actors is important and the context of action is critical, the case study strategy has been argued to be particularly useful for practice-based problems (Galliers, 1991). The University of Cape Town case study is exploratory in nature. Case studies, in contrast

to ethnographic methods derived from anthropology, are conducted within a defined time frame.

Although there are numerous definitions of a case study, Yin (2002) defines the scope of a case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. Clearly, the case study research method was particularly well-suited to the inquiry, since the objective was the inquiry of how social presence and context awareness are used to leverage knowledge transforming actions of learners at the University of Cape Town – where the boundaries between phenomenon and context were not yet "clearly evident". The case study research method was also well-suited in view of the fact that the interest and objective of the inquiry had shifted to learners and their environment as social systems rather than the technical issues.

The primary purpose of the UCT case study was to seek an understanding of the social awareness phenomenon, within its real-life context. The objective of the inquiry was to understand and to explain the socially-oriented phenomenon: social interaction situations whose outcome is knowledge transformation in authentic and natural settings. The inquiry represents the UCT mobile learning environment as it was during the case study research period. An inductive approach was used whereby an understanding is inferred from the empirical data. It was therefore essential that an interpretive research methodology guided the inquiry.

Interpretive researchers start out with the assumption that access to reality (given or socially constructed) is only through social constructions such as language, consciousness and shared meanings. The dynamic interaction between environmental contexts, mobile technology and learners in a

higher institution was investigated by observing and listening to individual perceptions and narratives.

The interpretive approach gave the research greater latitude to address issues of influence and impact, and to ask questions like "why" and "how" particular technological trajectories are created (Orlikowski and Baroudi, 1991; Boland, 1985).

3.4 Underpinning Theories

In this section I present the main ideas and concepts of the theories of Activity, Social Presence and Context Awareness as pertinent to the inquiry of social awareness in a mobile learning environment. They were used as lenses for the empirical data collection (discussed in chapter four) and the analysis of the data, discussed in chapter five. I begin by discussing Activity Theory and its relevance to the information systems research.

3.4.1 Overview of Activity Theory

In Activity Theory (Leont'ev, 1974; 1978) the unit of inquiry is an activity. The activity is composed of subject, object, actions, and operations. A *subject* is a person (a learner, in this study) or a group engaged in an activity. An *object* (as in the objective) is held by the subject and motivates activity, giving it a specific direction. Actions are goal-oriented processes that must be undertaken to fulfil the object. That is, the object (objective) provides a need or a desire, to which the activity always answers. A goal is held in the learner's mind and different actions may be undertaken to meet the same goal.

In the process of an activity, the object itself can be transformed but not on a moment-to-moment basis, however. The way action is carried out has some operational aspect, since operations become routine and unconscious with practice. Activities may overlap in that different subjects working together in coordinated actions may have various and conflicting objects (Kuutti, 1991). Activity theory focuses on the dynamic relationship between consciousness and activity (Nardi, 1996). The constituents of activity are not fixed but can dynamically change with changing situations.

A key concept in activity theory is the idea of *mediation* by artefacts. Artefacts – including instruments, signs, language, and machines – mediate activity and are created by people to control their own behaviour. Artefacts carry with them a particular culture and history (Kuutti, 1991).

3.4.1.2 Activity Theory and Information Systems Research

Activity Theory (AT) is an interpretive research approach that presents a framework within which to analyze the actions of people as they socially interact with each other in an attempt to accomplish a desired outcome. In the Information Systems field, Activity Theory has been used in Human Computer Interaction (HCI) and Computer Supported Cooperative Work (CSCW) as a way to overcome problems of contextuality when designing and researching IS (McMichael,1999), for example, Korpela et al. (2002) and Kuutti (1996 and 1991).

Activity theory has also been proposed and used as a research approach to study individual and social transformation in Information Systems development projects (e.g., Kuutti, 1999), coordination in networked organizations (Kuutti and Molin-Juustilla, 1998), cultural adoption and

rejection of IS (Gobbin, 1998) and as a framework to bridge the dichotomy between humans and technology (Hasan et al., 1998).

The preceding works suggest that Information Systems be studied using an activity based research focus to: 1) take into account the historical and ongoing contextual discovery of work practices and 2) acknowledge that Information Systems is a socially constructed tool subject to ongoing development by both users and designers (Kuutti, 1991). Activity theory provides a general integrated framework that can be used to reframe Information Systems by focusing on human activities and by highlighting the individual and collective contexts of IS (McMichael, 1999).

The following discussion highlights the key principles of Activity Theory that are of particular significance to information systems research.

3.4.1.2.1 Activities as Basic Units of Analysis

Actions are always situated in a context and they are impossible to understand without that context (Suchman, 1987). The provision offered by Activity Theory is that a minimal meaningful context for individual actions, both physical and mental, must be included in the basic unit of analysis. The unit is called an activity. An activity is doing in order to transform something. In this study, the end result of an activity is learning and transformation of knowledge. Since the context is included in the unit of analysis, the object of research is always essentially collective even if the main interest is in individual actions. An individual can and usually does participate in several activities simultaneously (Kuutti, 1996).

3.4.1.2.2 Artefacts and Mediation

A human activity always involves the use of various artefacts such as instruments, signs, procedures, machines, methods, laws, forms of work, etc. The fundamental feature of these artefacts is that they have a mediating role, since the relationships between elements of an activity are not direct but mediated. Artefacts have been created and transformed during the development of the activity itself and carry with them a particular culture – a historical residue of that development (Kuutti, 1996). An instrument, including human social processes, mediates between an actor and the object of doing. The object is seen and manipulated within the limitations set by the instrument (Engeström, 1999). The mediating tool makes it possible to mediate and change a supporting activity as subjects re-invent the context of their activities.

3.4.1.2.3 History and Development

Activities evolve over time within a culture; hence, an activity is a historically developed phenomenon (Jonassen and Rohrer-Murphy, 1999). Activities are not static but dynamic; they are under continuous change and development. This development is uneven and discontinuous so that each activity also has a history of its own. The historical analysis of the development is often needed in order to understand the current situation (Kuutti, 1996). A key task in historical analysis is periodization. Such an irreversible time structure is called an expansive cycle (Engeström, 1987).

Amid repetitive or expansive cycles, it is important to note that activity time is qualitatively different from action time. Action time is basically linear and anticipates a finite termination. Activity time is recurrent and cyclic. Action time corresponds to 'time's arrow' and activity time to 'time's cycle' (Gould,

1987). Activity theory recognizes the social and historical contexts as they evolve over time.

3.4.1.2.4 The Structure of an Activity

An activity is a form of doing directed to an object, and activities are differentiated from each other based on their objects. Transforming the object into an outcome motivates the existence of an activity. An object, e.g., knowledge, can be shared for manipulation and transformation by the participants in the activity. It is possible that the object and motive themselves will undergo changes during the process of an activity. The relationship between the subject and the object of activity is mediated by a tool. The tool is both enabling and limiting – it empowers the subject in the transformation process with the historically collected experience and skill, but it also restricts the interaction to be from the perspective of that particular tool or instrument only (Kuutti, 1996).

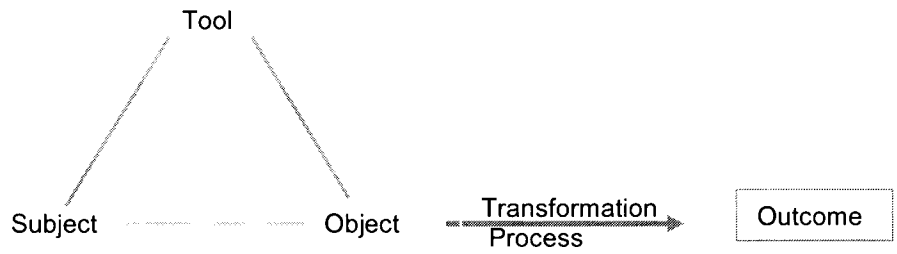

Fig. 9 Mediated relationship at the individual level (Engeström, 1987)

Figure 9 depicts the relationships between subject, object, and the mediating tool. The figure shows an activity at a mediated individual level and does not consider the systemic relations between an individual and

his or her environment. Figure 10 below, however, adds the third component showing a community of those who share the same object, that is, other mobile learners. The newly formed mediated relationships include subject-community and community-object. In essence, the figure shows the relationships between subject, object, and community. The subjects could be said to be always active, hardly passive, and continually evolving as they re-invent the context of their activity.

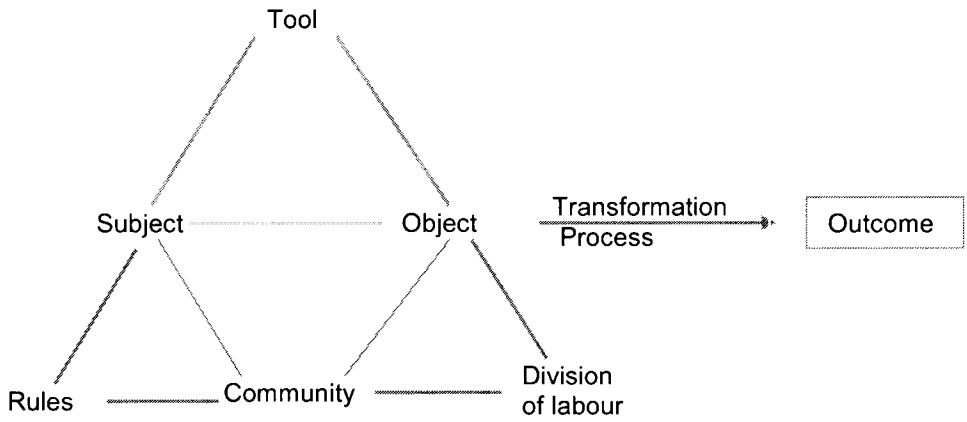

Fig. 10 A basic structure of an activity (Engeström, 1987)

Figure 10 draws attention to three reciprocal relationships involved in every activity: 1) The relationship between the subject and the object of the activity, which is mediated by tools that both enable and constrain the subject's action, 2) the relationship between the subject and the community, which is mediated by rules, and 3) the relationship between object and community, which is mediated by the division of labour.

> *A tool* is anything used in the transformation, including both the material tools and tools for thinking, e.g., wired and wireless devices, language, text, books, etc. In the study social awareness

is, above all, seen as an over-arching tool that mediates transformation.

Rules cover both explicit and implicit norms, practice, conventions, structures and social relations within a learning community.

Division of labour refers to the implicit and explicit organization of a community as related to the transformation process of the object into the outcome (Kuutti, 1996). Since the actions of mobile learners are mostly situated and not necessarily delegated, the division of labour is seen, rather, as roles undertaken by peers in the transformation of knowledge during a social interaction.

Activities are influenced by other activities as well as changes in their environment. External influences change some elements of activities, causing imbalances between them. This misfit within elements, between them, between different activities, or between phases of a single activity is called contradictions (*op. cit.*).

This research is about a learning community and social awareness. Using Activity Theory as a lens requires that learner activities be studied in context – where the political, economical, social as well as cultural realities of a learner are taken into account. An activity is itself a context. Nardi (1997) defines context as what takes place in an activity system composed of object, actions, and operation. "Context is constituted through the enactment of an activity involving people and artefacts. Context is internal to people – involving specific objects and goals; and external to people – involving artefacts, other people, and specific settings" (*op. cit.*, p38).

3.4.1.3 Conclusion on Activity Theory

Akin to other information systems research approaches, Activity Theory is not devoid of limitations. However, the key limitation of the AT research approach tend to also be its key strength. Activity Theory is not actually a theory as such, in that it is not "a fixed body of accurately defined statements" (Kuutti, 1996, p25). Rather, AT is a collection of broadly defined concepts that are open to varied applications; for example, Taylor et al. (2006) adapted Engeström's Expanded Activity System framework (1987) to understand how learners adopt, adapt and use technology. The framework as used depicts the dialectical relationship between mobile technology and learning. In this research, Activity theory provides a framework for analysing social awareness activities in a mobile learning environment – focusing on learning actions with or without mobile technology.

An AT research approach requires that the researcher develop a complete understanding of all forces impacting the system and the changes in activity systems over time, by immersing himself in the system under observation for the entirety of the process (McMichael, 1999). Activities are long term formations and their objects cannot be transformed into outcomes at once, but go through a process often consisting of several steps or phases (Kuutti, 1996). For the researcher to see out all these steps or phases there may be a need to use a varied set of data collection techniques to elicit a complete picture of the activity system (McMichael, 1999). To these points, this research employs four varied techniques in collecting data using contextual inquiry (see the discussion of the methods of data collection in chapter four).

Using Activity Theory means that the researcher must also understand and account for all history, actions, rules (both stated and unstated), tools,

communal norms and division of labour that are at play in the activity system. Since historical details are unique and cannot be assumed to exist in all activity systems, I have attempted to bring out the history and the local context of the research location and participants throughout the thesis.

In the next section, I discuss another underpinning theory of the research, social presence theory.

3.4.2 Social Presence Theory

3.4.2.1 Introduction

In this section, the concept and Theory of Social Presence is discussed. As I examined the social presence studies and literature, it became apparent that most, if not all, of the studies on the concept employ a positivist approach. Whilst this research employs an interpretive approach, it is essential that I highlight the extent to which the theory and concept has been explored in previous research – which in turn informed the re-definition of the concept as used in this research.

3.4.2.2 Previous Research on Social Presence

Short, Williams and Christie (1976) asserted that different communication media express varying degrees of social presence based on their ability to transmit nonverbal and vocal information. Thus, they initially introduced the Social Presence Theory as "technical social presence," defining it as the capacity of the medium itself to present the "salience of the other person in interpersonal interaction" (p65). Two concepts associated with social presence are "intimacy" (Argyle and Dean, 1965) and the concept of

"immediacy" (Wiener and Mehrabian, 1968). Intimacy depends on factors such as physical distance, eye contact, facial expression and personal topics of conversation. Immediacy is a measure of the psychological distance which a communicator puts between himself and the object of his communication.

This notion of Short et al. (1976) was, however, questioned by communication researchers (Gunawardena & Zittle, 1997; Byam,1995; Walther, 1994) who showed that perceived social presence in mediated interactions varies among participants in the same mediated conversations. That is, many of their research participants perceived mediated discourse as more personal than traditional classroom discussion.

The claim by Short et al. (1976) that the quality of the communication media determines its social presence or richness was disputed by Ngwenyama and Lee (1997) who showed that the communication richness of a media is dependent on who uses the media and how they use it. Gunawardena and Zittle (1997), for example, defined social presence as "the degree to which a person is perceived as 'real' in mediated communication" (*op. cit.*, p8). They, like Ngwenyama and Lee, also argued that social presence was as much a matter of individual perceptions as an objective quality of the medium. In a survey to measure students' perceptions of the social presence of others in a computer conference, Gunawardena and Zittle found that perceived social presence predicted more than half of the variance in students' satisfaction with the conference. Their results also indicated that students who felt a higher sense of social presence enhanced their computer communication using emoticons to express missing nonverbal cues in textual form.

Danchak, Walther and Swan (2001) theorized that people communicating online use such textual immediacy indicators to maintain a sense of affective equilibrium in their interactions. Equilibrium is a well-established concept in communications research that describes the ways people interacting face-to-face change their behaviours in response to each other in order to maintain an overall balance in the communication process (Argyle & Cook, 1976). For example, if one communicator moves closer to another, the other will tend to move away to maintain an equilibrium of distance. Danchak et al. (2001) argued that participants in environments with less affective communication channels available will evoke more immediacy behaviours to affect a kind of equilibrium of social presence with which they are comfortable.

Richardson & Swan (2003) used a modified version of Gunawardena and Zittle's (1997) survey to study the social presence perceived by students enrolled in seventeen online courses and its relationship to their perceived learning and satisfaction with course instructors. Their study found strong correlations between perceived social presence and perceived learning from individual course activities, including learning from activities not typically seen as social, such as individual assignments, tests, and lecture notes. Richardson & Swan (2003) theorized that their findings might be accounted for by the social presence of instructors and suggested that future research should distinguish between the perceived social presence of instructors and that of peers.

Picciano (2002) defined social presence as "a student's sense of being and belonging in a course" (p 24). He used survey items similar to the ones used by Gunawardena and Zittle (1997) and Richardson and Swan (2003) to measure perceived social presence, interactivity, and learning among students enrolled in an online graduate course in education, and found strong relationships among the three variables. Nevertheless, he

found no relationships between the variables and actual performance on tests or written assignments. Additionally, Picciano explored the findings by dividing students into groups perceiving low, medium and high social presence. Although he found no significant differences between groups on test scores, he did find significant differences on written assignments. Students in the high social presence group scored higher than the medium social presence group who outscored the low social presence group.

Rourke, Anderson, Garrison and Archer (2001) regard social presence as one of the three fundamental "presences" that support learning, the other two being cognitive presence and teaching presence. Thus, they define social presence as "the ability of learners to project themselves socially and affectively into a community of inquiry" (p50). Rourke et al. identified three categories of social presence indicators – affective experience, cohesive experiences, and interactive experiences – and explored their use in online discussion. Affective experience contain personal expressions of emotion, feelings, beliefs, and values; Cohesive experience are communication behaviours that build and sustain a sense of group commitment, such as greetings and salutations and group or personal reference; Interactive experience are behaviours that provide evidence that others are attending, such as agreement/disagreement, approval and referencing previous messages.

Swan (2002; 2003) used Rourke et al.'s (2001) categories and similar indicators of social presence to examine the ways in which social presence developed among students enrolled in an online graduate course in education. She found support for the Danchak et al. (2001) equilibrium model of students' high use of social presence indicators in their online messaging. Additionally, Swan found changes in the kinds of text-based social presence indicators utilized over time. She found that while the use of cohesive indicators decreased as the course progressed,

the use of interactive indicators increased. Affective indicators, the most frequently used, remained at about the same level throughout the course.

Tu (2000) also noted the relationship between perceived presence and success in online courses and further linked the development of social presence in online courses to course design. Based on elements of social learning theory, he distinguished three dimensions of course designs which influence the development of social presence: (i) social context, which includes task orientation, perceptions of privacy, topics, and social processes; (ii) online communication, which refers to the language course participants use to communicate and express themselves; and (iii) interactivity, which includes reciprocal communication patterns and timely experience. Some confirmation for these dimensions of social presence concerned with computer-mediated communication tools were later found by Tu and McIsaac (2002). They argued that these dimensions should be taken into consideration in the design of online courses.

3.4.2.3 Conclusion on Social Presence Theory

Although social presence theory has hardly been studied in mobile learning environments, research to date has shown that social presence can be strongly felt by participants in computer-mediated communication (Tu and McIsaac, 2002; Walther, 1994) and that students' perceptions of social presence have a strong influence on their satisfaction with online courses (Richardson and Swan, 2003; Tu, 2000; Gunawardena et al., 1997), and perhaps their learning from them (Picciano, 2002; Rourke et al., 2001). Content analyses of online course discussions (Swan, 2003 & 2002; Rourke et al., 2001) have identified ways in which participants project their presence using text alone, providing evidence that they make up for the lack of non-verbal and vocal cues through the use of textual

social presence indicators (Danchak et al., 2001; Gunawardena & Zittle, 1997).

There is, evidently, a lack of social presence research in mobile learning environments. Most studies of social presence have focused on the nature of online discussion and accordingly conceptualized social presence as a single construct with an emphasis on perceptions of the presence of peers (Swan, 2003 & 2002). As noted by Richardson and Swan (2003), there is some indication that instructor social presence may be equally important. Social presence of instructors has been considered in explorations of "teaching presence" (Shea et al., 2003; Anderson et al., 2001). Researchers have demonstrated both that students perceive the presence of others (Picciano, 2002; Gunawardena & Zittle, 1997; Gunawardena, 1995) and that they socially present themselves (Swan, 2003 & 2002; Rourke et al., 2001) in online course discussions.

I have already noted that virtually all research about Social Presence had been done in the positivist tradition. Nevertheless, there is lack of studies – positivist or interpretivist – looking at learners perceiving the presence of others and socially presenting themselves in a mobile learning environment or context. This research addresses this shortcoming and it does so by following an interpretive tradition, diverting from the positivist tradition.

3.4.2.4 Thesis definition of Social presence

In the thesis learners use awareness of a social presence for purposes of social interaction whose outcome is knowledge transformation. In this inquiry, social presence is defined and understood to be the mediated presence or the face-to-face presence of another learner who could

provide personalized on-demand social support for a learning problem as the learner traverses varied learning contexts.

Context and context awareness are also fundamental concepts in a learning environment where a learner is not fixed to particular locations. The concepts of context and context awareness are discussed in the next section, in view of the fact that they form the second phenomenon of the research.

3.4.3 Context and Context Awareness

3.4.3.1 Introduction

Human beings are quite successful at conveying ideas to each other and reacting appropriately. This is due to many factors: the richness of the language they share, the common understanding of how the world works, and an implicit understanding of everyday situations (Dey and Abowd, 1999). Context and context-awareness are fundamental concepts in a learning environment where a learner is not fixed to particular locations. The following discussion of context and context awareness studies and literature is intended to show how the concepts are relevant to mobile learning and ubiquitous social interaction. In these settings, the learner has increased freedom of mobility. Thus, the increase in mobility creates situations where the learner's context, such as the location, people and objects around him or her is more dynamic.

With mobile and ubiquitous computing, learners are likely to access information services and interact with peers whenever and wherever they are. With a wide range of possible learning situations, there is a need to have a way for the interaction to adapt appropriately in order to provide personalized support through social interaction, whose outcome is knowledge transformation.

In the next sections I discuss studies of context and context awareness. As with Social Presence, studies of Context Awareness are mostly in the positivist tradition. The studies are mostly approached from a computer science or a technology-driven perspective. Nevertheless, their discussion in the following sections is to highlight the varied understandings and usage of context and context awareness. This then allowed for an informed re-definition of the concept as relevant and applicable to the mobile learning research. This re-definition is given at the conclusion of the section (end of chapter).

3.4.3.2 Context Categories

Dey and Abowd (1999) define context as any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves. Ryan et al. (1997) suggest context types of location, environment, identity and time. Schilit et al. (1994) list the important aspects of context as where you are, who you are with and what resources are nearby. To that point, context-aware applications look at the *who*'s, *where*'s, *when*'s and *what*'s of entities and use this information to determine *why* the situation is occurring (Dey and Abowd, 1999). In my inquiry, an application does not actually determine why a situation is occurring.

Certain types of context such as *location*, *identity*, *activity* and *time* are of a fundamental nature, and therefore more important than others. The only difference between the preceding list and the definition of context provided by Ryan and his colleagues is the use of 'activity' rather than 'environment'. Environment is a synonym for context (Kekwaletswe and Ng'ambi, 2006a) and does not add to the investigation of context. Activity, on the other hand, answers a fundamental question of what is occurring in

the situation (Dey and Abowd, 1999). The categories provided by Schilit et al. (where you are, who you are with, and what objects are around you) only include location and identity information. To characterize a situation, we also need activity and time information.

Location, identity, time, and activity are the *primary* context types for characterizing the situation of a particular entity (Dey and Abowd, 1999). These context types not only answer the questions of who, what, when, and where, but also act as indices of other sources of contextual information. With an entity's location, we can determine what other objects or people are near the entity and what activity is occurring near the entity. From these examples, it should be evident that the primary pieces of context for one entity can be used as indices to find the *secondary* context (e.g., the email address) for that same entity as well as the primary context for other related entities such as other people in the same location (Dey and Abowd, 1999).

Lonsdale et al. (2003) describe context as a set of changing relationships that may be shaped by the history of those relationships. The figure below gives their hierarchical description of context as a dynamic process with historic dependencies.

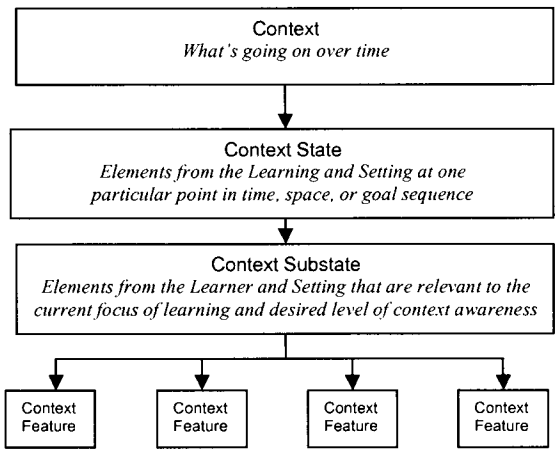

Fig. 11 Context hierarchy (Lonsdale et al., 2003)

In the figure above, a snapshot of a particular point in the ongoing context process can be captured in a *context state*. A context state contains all of the elements currently present within the ongoing context process that are relevant to a particular learning focus, such as the learner's current project, or a learning activity. A *context substate* is the set of those elements from the context state that are directly relevant to the current learning and application focus, that is to say, those things that are useful and usable for the current learning system. *Context features* are the individual elements found within a context substate. Each feature is atomic and refers to one specific item of information about the learner or his/her setting. In implementing context awareness within their architecture Lonsdale et al. (2003) derive a context substate and use the context features contained within it to determine what content might be appropriate for a learner.

3.4.3.3 Context-Aware Computing

Although the first investigation of context-aware computing was done in 1992 by Want and his colleagues (the Olivetti Active Badge), Schilit and Theimer (1994) are widely credited with the first definition of context-aware applications. They defined context-aware computing as the ability of a mobile user's applications to discover and react to changes in the environment they are situated in.

Since 1994, there have been numerous definitions of context-aware computing and applications. Generally, definitions of context-aware computing fall into two categories: using context and adapting to context.

Pascoe (1998) and Pascoe et al. (1998) define context-aware computing to be the ability of computing devices to detect and sense, interpret and

respond to aspects of a user's local environment and the computing devices themselves. Dey, Abowd and Wood (1999) bring in the concept of adaptation by defining context-awareness to be work leading to the automation of a software system based on knowledge of the user's context. Salber, Dey and Abowd (1998) define context-awarenes as the ability to provide maximum flexibility of a computational service based on real-time sensing of context.

The next definitions are in the more specific "adapting to context" category. Researchers such as Korteum et al. (1998), Brown et al. (1997) and Schilit et al. (1994) define context-aware applications to be applications that dynamically change or adapt their behaviour based on the context of the application and the user. Ryan (1997) defines context-aware applications to be applications that monitor input from environmental sensors and allow users to select from a range of physical and logical contexts according to their current interests or activities.

Brown (1998) defines context-aware applications as applications that automatically provide information and/or take actions according to the user's present context as detected by sensors. He also takes a narrow view of context-aware computing by stating that these actions can take the form of presenting information to the user, executing a program according to context, or configuring a graphical layout according to context. Fickas et al. (1997) define environment-directed (context-aware) applications to be applications that monitor changes in the environment and adapt their operation according to predefined or user-defined guidelines.

Ultimately, Dey and Abowd (1999) give a more accommodating definition of context-aware computing. They posit that a system is context-aware if it uses context to provide relevant information and/or services to the user, where relevancy depends on the user's task. I use their definition of

context-awareness to inform my investigation since the definition is applicable in the inquiry except that in the research, a learner and the mobile learning environment are regarded as a social system.

3.4.3.4 Usefulness of context awareness in the mobile learning environment

In this section I further discuss context awareness and how it is useful in a mobile learning environment.

Context is a key issue in interaction between human and computers, describing the surrounding facts that add meaning. In published mobile computing research the location factor is most often used to approximate context and to implement context-aware applications (Schmidt et al., 1999).

3.4.3.4.1 Factors related to Context

Context related to the human environment is structured into three categories (Schmidt et al., 1999):

- Information on the user; knowledge of habits, emotional state, bio-physiological situations.

- The user's social environment; co-location of others, social interaction, group dynamics.

- The user's tasks; spontaneous activity, engaged tasks, general goals.

Context related to the physical environment is also structured into three categories:

- Location; absolute position, relative position, co-location.
- Infrastructure; surrounding resources for computation, communication, task performance.
- Physical situations; noise, light, pressure (Schmidt et al., 1999).

An entity needs contextual information to choose between alternative strategies in order to reach its objectives, or to do useful work. Context gives hints about what is or what is not achievable (Rakotonirainy et al., 2000). If the initial knowledge sharing or transfer objectives are not reachable then they are changed to suit the current context, i.e., the objectives change or actions are taken according to the context to maintain an objective. The entire mobile learning environment is then seen as a set of entities associated with a set of adaptability rules.

The following sub-definitions allow two different meanings to context awareness:

i) *Abstract context awareness* means being aware of what you can know about your context.

ii) *Concrete context awareness* means being aware of what you do know about your context (*op. cit.*).

3.4.3.4.2 Abstract Context

An abstract context consists of the description of different observable dimensions (or attributes) characterizing a situation. A situation of an entity has a scope, it corresponds to a set of actions (something which happens) that has or can impact on the behaviour of the entity. The behaviour of an entity can be influenced by internal or external actions. Here, situation refers to the external actions. The abstract context can change (such as when a learner moves about different locations) as the set of observable attributes characterizing a situation of an entity changes (*op. cit.*). Consequently, being aware of the abstract context is being aware of what can be known or observed about a situation.

3.4.3.4.3 Concrete Context

A concrete context is an instantiation of an abstract context. Each attribute of the abstract context is assigned a value. Information in the current concrete context is restricted by the current abstract context (so that you cannot have a value for a non-existing attribute and the value might be constrained by a range). The values of the attributes belonging to a concrete context can change. Some values could become unknown (for some time), or unknowable (attribute not even in the abstract context). The absence of information about an attribute is still considered as useful information – knowable but not yet known (*op. cit.*).

3.4.3.5 Conclusion on Context and Context Awareness

From the preceding discussion on context research, it is apparent that context and context awareness are dynamic and complex concepts. On the technological view, mobile computers need "awareness" of several contextual factors including social, psychological, and physical (Tamminen

et al., 2004) to monitor the changing contexts of the learner and adapt appropriately. As it is, mobile context is a difficult concept to define, mainly because it involves a dynamically changing environment and has profound social roots. Different aspects of mobile contexts are created and maintained by situated actions in everyday life. Thus, I agree with Tamminen et al. (2004) that in order to be socially acceptable and useful, context-aware technology must be based on empirical knowledge of the context analysed from the perspective of the end-user. This thesis is therefore imperatively following their argument where context is looked at from the mobile learner's outlook.

The three broad categories of context: environment, participants, and activities as well as how time is placed within the context (Tarasewich, 2003) seem more appropriate for the research purpose.

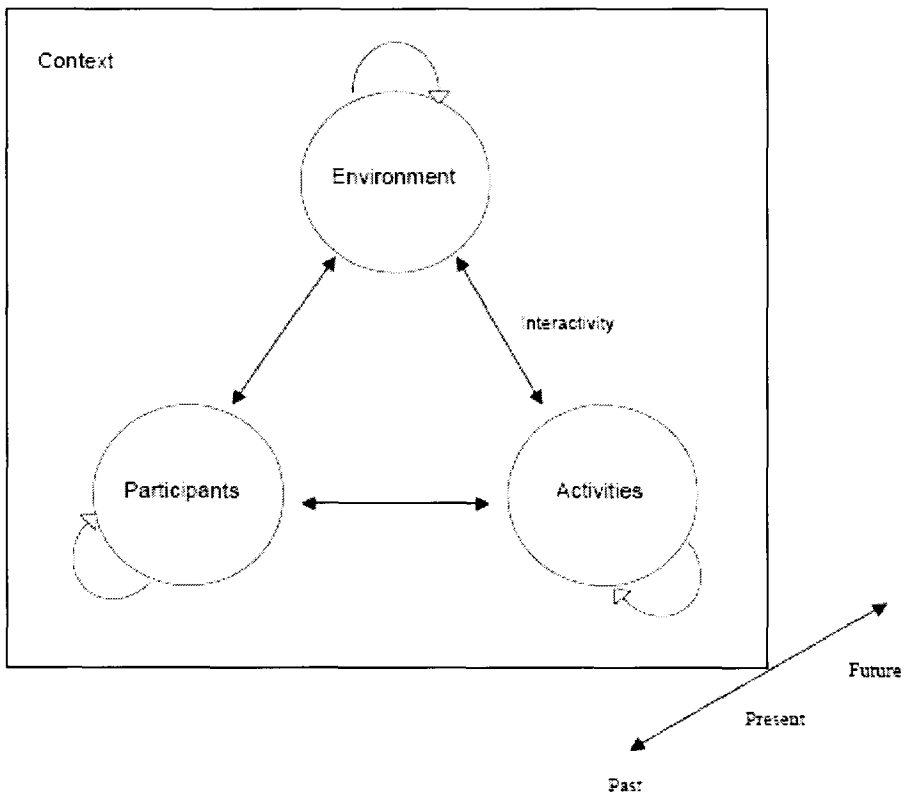

Fig. 12 Graphical representation of context model (Tarasewich, 2003)

In this model the three categories are all considered over a timeline of past, present and future so that past context can be used for comparison to the current context or predicting the future context. The time-related side of context (e.g., season, time-of-day) is treated as a set of relationships between absolute time (along a timeline) and other context characteristics. For example, any point in time has associated with it a value for a day-of-the-week, depending on location. A day-of-the-week may be related to specific learner expectations, group dynamics, learning activities, and events. These time-related concepts are incorporated into the model as interactions.

The three categories broadly group together the context factors that deal with the learners, their learning activities and the surrounding ubiquitous environment.

3.4.3.6 Context-Aware Research Approach

This section looks at the context terms as understood and used in the research. The term "environment" contains context factors that are outside of the control of the learners or other participants. The term "participants" includes the status of the learners or other participants. The term "activities" covers learner, participant, and environmental activities. "Interactions" deal with those characteristics that pertain to interactions and relationships between individual learners, their activities, and the environment. Table 3 is a summary of some of the characteristics of the context model.

Table 3. Characteristics of the context model

Category	Representative Characteristics
Environment	Location, Orientation (of objects) Physical properties Brightness and noise levels Availability, quality (PDA devices and communications)
Participants	Location, Orientation Personal properties (e.g., age, gender, background, skills, preferences) Mental state Physical health Expectations (consists of the learner's recent experiences, what the learner is waiting for or expects to happen next)
Activities	Tasks and goals (of participants: spontaneous or planned) and behaviours of other learners Events in the environment (e.g., weather)
Interactions	Interactions between learners Co-location Group dynamics Social situations Participant/environment relationships (e.g., learner/ learning place) Season, time-of-day, day-of-the-week; exam time.

(Tarasewich, 2003: modified)

Table 3 presents a context model used to guide the research. I share the argument of Tamminen et al. (2004) that contexts are always determined by their specific use situation loaded with different action resources: motives, plans, other people, mobile devices, etc. Like-wise, I focused on the interaction and situated nature of mobile learning contexts by explaining and analysing trivial actions and resources by which learners manage their mundane activities in a particular mobile learning circumstance. This allowed me to gain insights on how mobile contexts are "created" and to what extent these actions could be positively mediated by mobile devices.

Thesis definition of Context

The preceding section gave varied discussions of context and context awareness. This research looked at context awareness where context is: a learning location or situation, learner as the participant, social interaction of learners, as well as activities and actions.

The next chapter discusses how the interpretive inquiry of ubiquitous context and social presence awareness was conducted. It describes the local research context and describes the method for empirical data collection. The chapter also discusses the technology used and describes the participants as well as the research site.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Introduction

In this chapter I describe the methods used to carry out the exploratory case study. Research methodology is a logical way of conducting research by using a set of methods which are based on a shared, more or less explicit philosophy or approach (Avison & Fitzgerald 1995). Research methodologies in Information Systems include but are not limited to analytical modeling, surveys, case studies, laboratory experiments, field experiments, theorem proof, ethnography, grounded theory, critical theory, and action research (Mingers, 2001; Teng and Galletta, 1991).

This case study is about social awareness influencing and mediating activities whose outcome is knowledge transformation. Activities cannot transform into outcomes at once, but go through a process often consisting of several steps or phases (Kuutti, 1996). For the researcher to see out all these steps or phases there may be a need to use a varied set of data collection techniques to elicit a complete picture of the activity system (McMichael, 1999). To this point, the research employed four strategies for data collection – these strategies included interaction text, observation, interviews and a qualitative questionnaire. Using multiple sources of information develops converging lines of inquiry; hence findings are likely to be more plausible and accurate. However, this technique also has limitations. For example, the use of multiple strategies within a single study has been known to nullify extraneous influences (Yin, 2002). Nevertheless, in this inquiry where learners move about different environments, such triangulation helps to address the problems of validity and reliability.

Observation allowed the gathering of rich data in real and natural settings. Rich data meant a better description and understanding of the

phenomenon – socially-oriented learning contexts. In addition to observations, interaction text, and the questionnaire, contextual interviews were conducted with learners in authentic learning contexts. The interviews were situated, thus open-ended, and conducted in a conversational manner. These strategies are discussed further in the chapter.

4.2 RESEARCH DESIGN

> "Socio-cultural theories of mediated learning suggest that what is learned will emerge from the relationship between human action, and the social, cultural, institutional and historical contexts in which action occurs. This makes it essential for us to understand these contexts and activities before we begin to investigate issues of learning" (Sutherland et al., 2000).

4.2.1 Research Location and Premise

In chapter one, I noted that one of the prevailing challenges in the new South African higher education is that of providing personalized support to under-prepared learners – who by the very nature of the South African population come from diverse backgrounds and cultures. In most African cultures, it is uncommon for younger people to interact with or question their elders. This phenomenon tends to apply in an educational environment where learners are not comfortable questioning the instructors. The alternative for them is to consult and interact with their close friends and knowledgeable peers to provide academic support.

Consequently, this inquiry was about interactions amongst learners (peers) for purposes of knowledge transformation, as they traverse varied learning

locations. However, it is worth noting that in South Africa, availability and access to wireless, let alone wired, computers, remains a challenge. These resources become even more inadequate as you move away from campus. The research was therefore guided by the three localized learning contexts discussed in chapter one, which apply to the University of Cape Town as a contact university.

4.2.2 Research Framework Re-visited

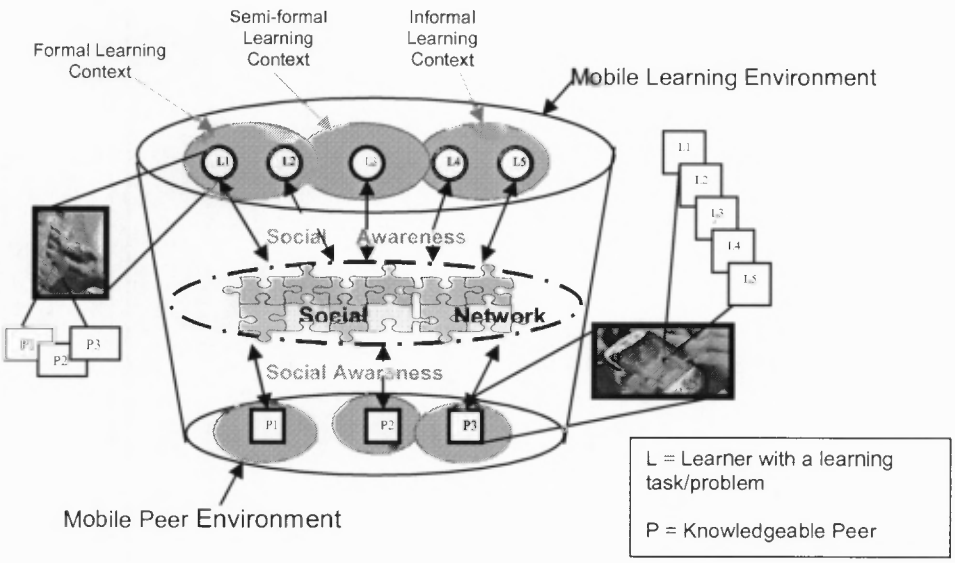

Fig.13 A framework for mobile learner/peer environment (Kekwaletswe, 2006)

The framework – Figure 13 – depicts social awareness and presence in three different learning contexts of the mobile learning environment. Social awareness is a mental concept where a peer and a learner become aware of the social network that *follows them* as they move across the varied learning contexts (Kekwaletswe, 2006). In figure 13, a learner is consciously aware of available knowledgeable peers should s/he encounter a learning problem for which s/he needs to consult. By the same

token, a peer is consciously aware of the presence of other mobile learners should s/he not be able to address a problem encountered by a learner. That is, a learner and a knowledgeable peer have a consistent social awareness of a social network (social resources) regardless of their location and context. Even though learners also interact via Web-based environments, in this research, the social awareness and availability of social resources in remote locations is mostly mediated by mobile technologies, e.g., mobile phones and PDAs.

4.2.3 Research Model

Knowledge sharing involves two actions: transmission (sending or presenting knowledge to a potential learner) and absorption by the audience (Davenport and Prusak, 1998). If knowledge is not absorbed, it has not been shared. In other words, merely making knowledge available is not sharing. In this regard, social interaction achieved and enhanced by awareness of context and presence is necessary.

The research investigated how mobile learners use social awareness – social presence and context awareness – to enable a knowledge transforming interaction. I sought to understand ubiquitous mobile learning where learners support others as they traverse the three learning contexts. Dey and Abowd (1999) suggest that context-aware applications look at the *who's, where's, when's* and *what's* (that is, what the user is doing) of entities and use this information to determine why the situation is occurring. The context-aware interaction environment supports a *learner* (who) as they engage with the *learning materials* (what), whether in *semi-formal or informal learning contexts* (where), *anytime* (when) through the use of context awareness and social presence mechanisms (Kekwaletswe and Ng'ambi, 2006a).

4.2.4 Technological Tools Used and Rationale

Communication or interaction that is mediated by technology is generally grouped into two categories: asynchronous and synchronous.

Asynchronous communication occurs between learners independent of time and location. This kind of communication does not need the sending and the receiving learners to be "available" concurrently. Examples include leaving a phone voicemail, posting to or reading a discussion board, and sending and receiving email (although this could also be considered synchronous). On the other hand, synchronous mediated-interaction is considered a "real-time" experience between two or more learners. Examples of tools that facilitate synchronous communication include telephones, audio-video conferencing software, instant messaging, virtual chat, virtual classrooms, and whiteboards.

Asynchronous and synchronous mediated-communication can be used in individual or group learning situations, as well as traditional or online learning environments. Although a significant body of research validates the notion that learning is a social act, learners may still acquire knowledge in a mediated interaction. There are several forms of technology mediated communication, such as electronic mail, web-based consultation environments, e.g., Dynamic Frequently Asked Question (Ng'ambi and Hardman, 2004), instant messaging on wired networks and short message service (SMS) on mobile phones. Although they support mobility of a learner and may afford presence awareness, they do not do so in real-time.

In the case study, there was a need to select a mediating technology that supports mobility of a learner as well as presence awareness of available peers in real-time. I selected a mobile instant messenger (IM) Jabber client for Pocket PCs (PDAs) called *iMov messenger* (www.jabber.org).

The mobile instant messaging on PDAs supports an immediate on-demand formal or informal expressive interaction. Such real-time interaction could be one-to-one or several concurrent dyadic conversations. Mobile IM provides mobile learners with a real-time interactive space to share learning experiences – exchanging textual messages that do not require detailed email-like messages or face-to-face interactions. A brief review of Instant Messaging (IM) studies and Jabber systems communication follows.

4.2.5 Overview of Instant Messaging

Instant messaging, once viewed as a social virtual meeting place for teenagers, is fast growing into a practical workplace communication tool (Alexander, 2005). Presence awareness, a common feature in IM, gives an immediate view of who among your peers is logged on and available for social interaction. This presence awareness feature also allows one to identify the right person (context awareness) for an immediate knowledge exchange.

Instant messaging is a tool that successfully supports informal communication (Grinter & Palen, 2002; Grinter & Eldridge, 2001) and hence offers the potential to facilitate knowledge transfer, instantly. Cases have been reported where instant messaging was preferred to informal face-to-face conversation because it is less intrusive and allows multitasking (Nardi et al., 2000). IM has been adopted by teenagers for socializing, and by adults for both social and work purposes (Grinter & Palen, 2002; Nardi et al., 2000). However, there is a lack of research of instant messaging in a mobile learning environment. A better understanding of the social presence in instant messaging that enables and supports the

informal social interaction and communication would help in determining and explaining its value in learning and knowledge transfer.

Descriptions of instant messaging from prior studies generally fall into three areas:

i) the character of IM conversations (Grinter & Palen, 2002; Nardi et al., 2000)

ii) the functions of IM, i.e., the tasks it is used to support (Radicati Market Report,. 2001; Mahowald & Levitt, 2000)

iii) the pattern of IM use, i.e., how frequently people use IM and with whom (Isaacs et al., 2002; Rhinelander, 2000)

4.2.6 Conclusion on Instant Messaging

General observations and suggestions made from instant messaging studies could be concluded as follows:

i) IM conversations have a specific character: they tend to be brief (but could also be used for longer, discontinuous interactions between established learners) and cover a single topic, and both media switching and multitasking are prevalent. Therefore, during the IM social presence, learners could engage in other knowledge acquisition means while maintaining their presence.

ii) IM is used for four main functions: quick question and clarifications, coordinating impromptu learner-related meetings, coordinating impromptu social meetings, and keeping in touch.

In the mobile IM environment, the learner is mobile and context and social presence awareness are no longer limited unlike with the wired communication or in a formal class. The learner, being mobile, is ensured of the opportunistic and appropriate social interaction anytime, anywhere, with anyone in their social network. Serendipitous learning and knowledge acquisition may be realized in this social space.

4.2.7 Jabber Systems

With the increasing need for instant interaction, there are several different instant messaging systems on the current communication market. Most of the IM systems are, however, made for wired desktop PCs with only a handful made for mobile devices. *iMov messenger* application is one such Jabber IM system made to support mobility (jabber.org).

Jabber uses a client-server architecture where all client-to-client communication (data and messages) is handled by a Jabber server. The architecture is further based on several distributed networks of servers. Jabber servers can talk to each other and therefore accept varied user connections. The local server is responsible for user registrations and is responsible for transmitting presence information as well as messages to other Jabber servers. Each server functions independently of the other, maintaining its localized user list, logs, etc. Jabber servers and clients communicate via the Internet, where an individual user is associated with a specific Jabber server (www.Jabber.org/docs).

With the help of the technology team at the Centre for Educational Technology, the local university Jabber server – *jabber.uct.ac.za* – was put up for the purpose of the research. With the local Jabber server set up, it became easier for any UCT registered learner, including study

participants, to login and use the iMov messenger client – installed in the Wi-Fi enabled PDAs – to interact with peers. Participants with PDAs utilized the few available UCT wireless network access points and the temporary ones I positioned for the case study.

4.3 Method of Data Gathering

The objective was to collect data – in natural settings – that would help me have a deeper understanding of how mobile learners use social awareness to facilitate actions and interaction with others for the purpose of knowledge transformation in varied learning contexts. The study, therefore, employed Contextual Inquiry as the main research method in the case study.

4.3.1 Contextual Inquiry

Contextual inquiry is an interpretive field research framework that depends on conversations with users in the context of their work (Holtzblatt and Jones 1994). It is based on ethnography, where the researcher goes into the research participant's own environment. It is an explicit step for understanding who the user really is and how the work progresses from day to day (Beyer and Holtzblatt, 1998).

Contextual inquiry enables dialogue among designers and users to go beyond the surface abstractions of the work by using artefacts in the work context to uncover details about the work. These details and the narratives or stories that emerge may provide grounding for the educational design. That is, they provide the basic principles on which far-reaching design decisions, such as organization, content, and presentation, can be made (Beabes and Flanders, 1995).

The contextual inquiry consisted of mobile technology mediated interactions, observation of learning environments, contextual interviews with learners engaged in authentic learning tasks, and a qualitative questionnaire. In contextual inquiry, the researcher stays in the background for most of the time, but also inquires about the events that are not obvious but may be significant regarding the focus of the research (Ruuska and Vaananen-VainioMattila, 1998).

4.3.2 Contextual Inquiry Principles

The three key principles that further define Contextual Inquiry are context, partnership, and focus (Raven and Flanders, 1996):

1. Data gathering must take place in the context of the users' work.

2. The data gatherer and the user form a partnership to explore issues together.

3. The inquiry is based on a focus; that is, it is based on a clearly defined set of concerns, rather than on a list of specific questions (as in a survey).

Data gathering took place in the context of the learners' actions and tasks. Context was the environment and the situation in which learners learn. Advocates of Contextual Inquiry realize that you cannot fully understand what people are doing or why they are doing it unless you can see – and perhaps experience – the interrelated situations in which they work. Consequently, context is the interrelated situations within which something occurs or exists. Observing and talking with learners in the context of performing learning tasks helped me to gather data that is different from the type of data one would obtain from questionnaires or surveys (Raven

and Flanders, 1996). Context has temporal, physical, and social aspects. In the research, I paid attention to all these aspects, like Perelman and Olbrechts-Tyteca, (1969) suggested.

The learners and I formed a partnership to explore issues together. The approach was to use an open-ended process where a learner's action and response modelled the construction of the interview questions. Contextual Inquiry differs from a traditional interview in that traditional interviews have an interviewer who is usually in charge of the topics and flow of conversation. Contextual Inquiry is based on the premise that the inquirer and the participants are equals (Raven and Flanders, 1996). Partnerships provided a way for me (the inquirer) to continually validate the assumptions made while observing learners. That is, I asked participants why they did things instead of interpreting their actions on my own.

The inquiry was based on a focus, that is, a perspective and set of concerns. Focus was the overarching theme of the interview and the direction that the dialogue took (Beabes and Flanders, 1995). Since the interview was based on a focus, social awareness, rather than on a set of specific questions, I had the flexibility to follow a promising avenue of conversation that might not have been in a list of questions.

4.4 Case Study Participants

The research was conducted at the University of Cape Town upper campus and residences. Participants were drawn from full-time registered undergraduate learners. The following brief historical background of the university is meant to help the reader understand the participants' background.

4.4.1 A brief history of the University of Cape Town

The University of Cape Town (UCT) is South Africa's oldest university, and is one of the leading teaching and research institutions in Africa. It was founded in 1829 as the South African College, a boys' school which also provided some tertiary education, and was formally established as a university in 1918. It moved to its present site in 1928.

Apart from establishing itself as a leading research and teaching university in the decades that followed, the period 1960 to 1990 was marked by sustained opposition to apartheid. The University of Cape Town earned itself the nickname "Moscow on the Hill' during the 1960s, 70s and 80s for its continued opposition to apartheid, particularly in higher education. The University admitted its first small group of black students in the 1920s. The number of black students remained relatively low until the 1980s and 90s, when the institution – reading and welcoming the signs of change in the country – committed to a deliberate and planned process of internal transformation.

From the 1980s to the early 1990s, the number of black students admitted to the university rose by 35 percent. By 2004, nearly half of the 20 000 UCT students were black and just under half of the student body was female. Today UCT has one of the most diverse campuses in South Africa.

The University recognises its role in striving to end the racial fragmentation of the higher education system inherited from the past and to build a diverse student profile that predominantly reflects the demographics of South African society, while also reflecting the University's international profile. Thus, UCT is committed to transformation, and recognises the educational value of a diverse student and staff body (Source online at *http://www.175.uct.ac.za/history/?f=1).*

4.4.2 How empirical data was collected

This thesis is about providing personalized academic support for UCT mobile learners with diverse social backgrounds, outside of the formal learning contexts.

> "Knowledge is a fluid mix of framed experiences, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers." (Davenport and Prusak, 1998, p5).

This study was not about how knowledge is created or applied in the minds of learners but rather about activities and interactions that result in a learner's knowledge being transformed. Contextual inquiry allowed me to gain an insight into the perspectives and understanding of the social awareness phenomenon from the participants' point of view. Guided by the research questions, I wanted to learn and observe how learners use social awareness to mediate their actions as well as the meanings they assign to particular social factors. I interacted with participants, observing their actions and their social environments in authentic learning contexts so that it could be possible to describe and understand behaviour or actions of learners in real settings.

This interpretive inquiry was interested in experiences and actions of learners in their real and natural learning environment. For that reason, it was essential that I got close to participants through physical proximity as well as through development of closeness in the social sense of shared experience and confidentiality (Patton, 1990). A case study investigates a phenomenon within its real-life context using multiple sources of evidence (Yin, 1994) and a case must have a beginning and an end. The case

study began with pilot runs in March 2006 and were conducted at varied times, until November 2006.

Mobile learning activities are long term formations and their objects cannot be transformed into outcomes at once, but go through a process often consisting of several steps or phases (Kuutti, 1996). For the researcher to see out all these steps or phases there may be a need to use a varied set of data collection techniques to elicit a complete picture of the activity system (McMichael, 1999). To these points, I chose to use four varied sources of evidence – qualitative questionnaires, contextual interviews, mobile instant messaging texts and observations. These four techniques are described in the following section.

4.4.3 Four Sources of Evidence Data

Since the UCT learners are mobile and engage in learning activities regardless of location and time, the collection of empirical data was done in semi-formal and informal learning contexts as shown below.

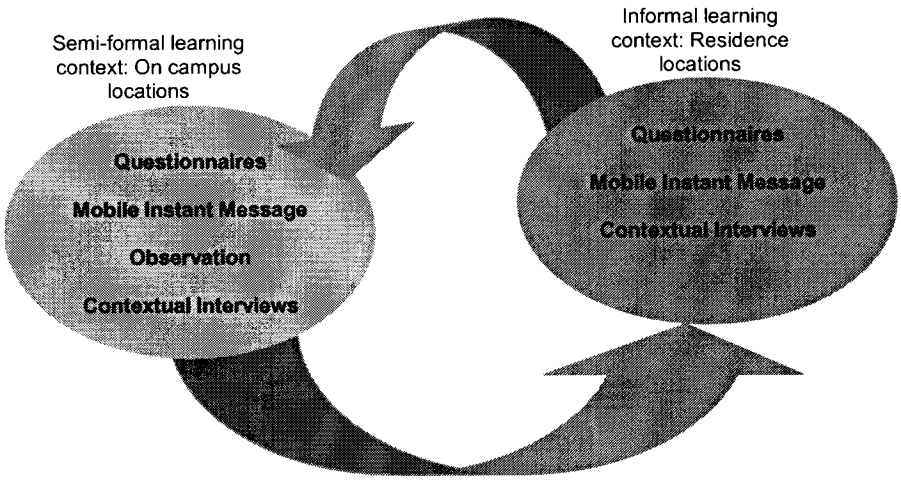

Fig. 14 The collection of empirical data in two learning contexts

Figure 14 depicts where empirical evidence was collected. The arrows show mobility of learners between the two learning contexts. The case study began by giving out sixty (60) qualitative questionnaires to learners on campus and at the off-campus university residences. Twenty of the learners who filled in the questionnaire were then given Wi-Fi enabled PDAs installed with iMov messenger, the IM client. Contextual Interviews were done with four learners who were part of the group of twenty given the PDAs. Two of the four learners were also used as references in observing the situational learning actions and activities in authentic semi-informal learning contexts.

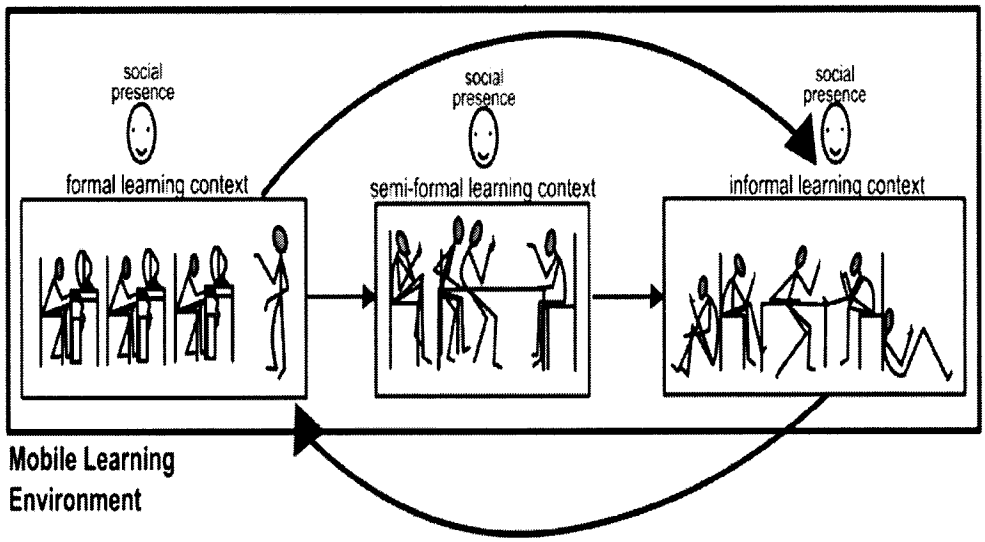

Fig. 15 Learner mobility and social presence in three learning contexts

Figure 15 shows learners in three learning contexts. In formal learning contexts learners are mostly passive, with the instructor often determining the learning pace. In semi-formal and informal contexts, learners study or engage with a learning task either in isolation or by interacting with peers. The four varied data sources are each unpacked below.

4.4.3.1 The Qualitative Questionnaire

A qualitative questionnaire was used to draw from a diverse UCT learner population. Learners, who either sat in a group or in isolation, were approached and asked if they would participate in the study by responding to the qualitative questionnaire. Contact with these learners was not pre-arranged. In other words, it was situational and the learner(s) I approached could have been any other learner(s) I came in contact with during that time. The participants completed the questionnaires on the spot. There was no participant selection criterion except that the qualitative questionnaire had to capture authentic experiences that represent a mobile UCT learner.

Thirty (30) questionnaires were handed out to learners in the semi-formal learning contexts (on campus locations outside of formal classes and laboratories) and another 30 in the informal learning contexts (UCT residences), respectively. In the end, the questionnaires were filled in by mobile learners with diverse backgrounds (including race, class levels, faculty and gender) representing the university learner population.

Out of the sixty (60) qualitative questionnaires handed out, a total of 53 were partially or fully completed. Twenty three (23) of these were completed on campus locations (seven learners decided against participation – since participation was voluntary, reasons for the decisions were not sought) and 30 were completed in the residences. 30 questionnaires were handed out at three UCT residences: Forest Hills, Liesbeeck Gardens and Clarinus Village. All questionnaires handed out at the residences were completed, which could suggest the context contrast of the semi-formal and informal settings, e.g., time or the willingness to engage in such activity in a relaxed setting at home.

This is an interpretive study and consequently it is not based on the strength or weakness of numbers or sample quantities. By highlighting the numbers, above, I only want to give the reader a sense of where and how the qualitative questionnaire data was collected.

4.4.3.2 Mediated Interaction via Mobile Instant Messaging

The rationale behind mediated interaction is that a meaningful consultation that could happen face-to-face could still exist with learners who are not fixed to certain locations or not co-located. The recruiting of participants for the mobile IM case unit was done during the qualitative questionnaire data collection. After filling in the questionnaire, learners who showed interest and were enthusiastic about taking further part in the study were asked for their contact details. I selected and contacted twenty of the learners.

The twenty learners were each given a Wi-Fi enabled PDA, installed with a mobile instant messenger client called *iMov messenger*. They were broken into small groups where they chose who they wanted to interact with (social networks). I orientated them to how the PDA works and showed them where the UCT wireless network access points, plus the temporary ones I put up, were located. The twenty learners were selected to be representative of the five UCT academic faculties; so that the PDA mediated interaction was not about a specific academic programme. Thus the PDA case unit included learners with varied computer or ICT skills and experiences.

Mobile instant messaging was to facilitate the text-based interaction amongst learners in authentic semi-formal and informal learning contexts through its social presence awareness mechanism. The learners, who kept the PDAs for the duration of the study, were encouraged to interact

through mobile IM at any given opportunity. To make the mediated learning interactions more authentic, learners used their discretion and opportunity in using the mobile instant messaging. That is, since wireless hotspots are not readily available everywhere and did not cover the entire semi-formal and informal environments, learners interacted using PDAs during instances where the peers happened to be near a wireless access point. Neither the UCT wireless network nor the temporary ones I set up, could cover all campus areas and residences. Thus, the ubiquitous social awareness via mobile instant messaging was limited.

Nearly all IM interactions tend to be brief and cover a single topic. Although most IM interactions among the twenty learners were logged by the Jabber server, interactions concerning five learners (Pono, Molefi, Hazel, Mmoloki and Neo – pseudo names) were the ones analyzed in chapter five. The interactions were little longer, showing continuous interactions between learners.

4.4.3.3 The Contextual Interviews

The interviews were meant to allow participants to share their experiences, verbally, in authentic learning contexts. The interviews were based on the premise that the participants and I were equals. Thus the partnership provided a way for me to continually validate the assumptions made while observing learners as they interacted within a mobile learning environment. That is, I asked participants why they did things instead of interpreting these on my own. The contextual interviews happened at the UCT informal campus locations and the UCT residence locations. Firstly, I talked to learners as they were engaged and interacting with the environment, the learning material and during social interaction with peers outside formal classes, but within the UCT main campus. Secondly, I

talked to learners in their residence rooms, where they do most of their studying in isolation.

The rationale behind doing the interviews this way was to understand the knowledge transforming actions in real locations while and where learners actually perform learning tasks. I have already noted that this research, and hence the case study, is only concerned with learning and knowledge transforming activities that happen outside the formal learning environments like scheduled lectures, so that learner mobility and social awareness were understood in view of activities in informal learning environments.

Four participants, Pono, Mickey, Molefi, and Hazel (pseudo names) took part in the contextual interviews. These participants had filled in the qualitative questionnaire and were part of the twenty involved with the mobile instant messaging case unit. The four were identified and selected based on their utmost cooperation and willingness during the first week of the PDA case unit, as well as their availability, especially during the mid-term examination week.

4.4.3.4 Observations (Thick Descriptions)

In this unit of data collection, I drew upon the research foundations utilized in the ethnographic approach to data collection described by Geertz (1973) as "thick description." The thick description approach was adopted since it is through inquiry of the observations about the languages, learning situations, and other social practices recognized in the main research that questions about social awareness and mobile learning environments could be explored. The ethnographic method requires the researcher to closely observe, record, and engage in the daily life of people in the field and write about it in descriptive detail (Schultze, 2001).

The main difference between ethnography and thick description is the duration of time spent at the research site (Klein & Myers, 1999). Nevertheless, they both aim at rich and full descriptions of a particular research site.

For purposes of the inquiry, it would not be plausible to observe all UCT learners. Instead, I opted to focus the observations on two learners – Molefi and Hazel – as they interacted with others and the environment. These two were observed and followed with their consent and understanding. They were, again, identified after showing a consistent cooperation and utmost interest throughout the case study. The two learners were followed and observed as they went about their mundane activities on campus informal locations. This option allowed me to have a much richer observation and description of authentic events as they unfolded.

The observations were done in an attempt to understand the phenomenon of learner mobility where they engage with situational and planned actions which result in knowledge transformation; that is, to capture the everyday life of a mobile learner in real and authentic learning contexts outside the formal learning contexts. Accordingly, no activity was pre-determined or planned with them. Since the observations happened in authentic contexts but at different times of the days, we established and agreed on the times and locations where the observations would be done during the case study period – the observation week of November 6, 2006. At the agreed times and dates, my task was to locate the participant and make descriptive notes while taking pictures every now and then – see some of the pictures at the end of this section and throughout chapter five.

Observations allowed me to learn as much as possible about the natural settings of a mobile learning environment and the participants so that I

could then describe the social awareness and the environmental realities much more accurately. By staying in the background, I observed participants and their peers in order that I could have an informed understanding of how social awareness may be a catalyst for social interactions whose outcome is knowledge transformation, in authentic mobile learning environments.

Fig. 16 UCT Mobile Learning Environments: Social Presence and Context-Aware Ubiquitous Learning

Figure 16 shows mobile learners in varied mobile learning environments captured at the UCT informal locations. In these environments, ubiquitous learning happens either in isolation or by interacting with peers face-to-face. Where peers were not in the same location, learners used mobile devices – mobile phones and PDAs – in addition to wired PCs in the laboratories to mediate the contextual social interaction and social presence. UCT mobile learning environments included, for example, the shuttle bus stops, the open laboratories, walking to the next lecture room, student centre at the Leslie social building, Jameson Hall stairs, university library and the residences.

4.5 Conclusion of the Research Methodology

This chapter gave an overview of how I conducted the empirical research, highlighting the contextual inquiry method followed to collect data and evidence. The research was done in authentic mobile learning environments, hence the need to follow the contextual inquiry method. The four methodological choices used to collect data were made for their

capability to meet the demands of the theories underpinning the thesis – including the dynamic learning environments, situated actions, context awareness and social presence. In the next chapter, I analyze the empirical data to unfold how learners used social awareness as a means of coordination and communication in a learning activity – for purposes of social interaction whose outcome is knowledge transformation.

CHAPTER FIVE: EMPIRICAL DATA ANALYSIS and DISCUSSION

5.1 Introduction

> "If a person's activity results in the improvement of another's condition, the activity eventuating in this end may be designated as "help" or "support." "I am helped" refers to the result of another's activity with reference to the other's actions" (Gergen, 1994; p83).

When learners are engaged in a learning activity, they are able to use implicit and explicit context awareness to increase or decrease the interaction whose outcome is learners "helping" or "supporting" each other. The notion of social interaction presupposes an existence of two or more learners speaking or acting. Embedded in this notion is the assumption that a learning community is socially present without which interaction – "help" or "support" – is impossible.

In this chapter I analyze and discuss the activities and actions of learners as observed and captured during the case study to see how the phenomena of social awareness and interaction decisions are closely related – for the improvement (transformation) of the learner's knowledge. The data analyzed were collected in the semi-formal and informal learning contexts, where learners needed to "help" or "were helped" through social interaction influenced by social awareness. The formal learning context data was neither collected nor analyzed since "help" or "being helped" through social awareness is less needed and the activities of learners are mostly passive, as already stated in the introduction chapter.

The inquiry focused on social awareness – experiences, activities and intentions of learners to transform knowledge through social interaction as

they move about varied learning environments. For that reason, I sought to use a theoretical lens that helps explain intentions, activities and behaviour. Since this was in essence an inquiry of knowledge transformation attributable to social awareness in a mobile learning environment, Activity Theory (Leont'ev, 1974; 1978) seemed suited to the task of analyzing the empirical evidence collected.

The analysis starts with data from the qualitative questionnaire, followed by textual interactions (IM), contextual observations and contextual interviews, respectively.

5.2 Analysis of the Qualitative Questionnaire Data

5.2.1 Introduction

The qualitative questionnaire was used to collect data about the perspectives and realities of UCT learners, in terms of how they use social awareness. The use of the questionnaire permitted the collection of experiences from a wider population of learners. Responses noted are from different learners. Similar responses and shared learner experiences in the questionnaires were grouped and noted as one, which further reduced entries from the fifty three collected.

Social presence and context awareness is about the *what, where, why, who* and *when*. In the following section I analyze and unpack the evidence associated with context and presence awareness. Activity Theory is used to analyze the learners' activity systems and settings for the purpose of learning and knowledge transformation. The focus of analysis is on the interaction of learners' activity and consciousness (the learner's mind) within its relevant mobile learning environmental context. Activity Theory emphasizes the importance of motive and consciousness where tools

mediate a human thought, interaction and behaviour. The Activity Theory analysis is given at the end of the section.

5.2.2 Analysis of the questionnaire data

The analysis of each questionnaire probe is in three parts: What the researcher wanted to know, the learner's experience and a brief discussion. The experiences are grouped in a table form per research theme and query. Doing the data analysis this way was to allow the reader to see where the low level research questions that support the main questions are addressed.

Table 4. How does a learner interact with others?

Researcher's Intention	Different Learners' response/ experiences	Researcher's Comments
How does a learner usually communicate with peers, besides face-to-face meetings, when faced with a learning problem and needing help?	...Through SMS, ...I call or email, ...I use my mobile phone, ...We do online chat, ...Mobile phone chat (via **miXit**). NB: *MiXit* is a mobile phone service that allows friends to chat (send/receive text) instantly and in real-time.	Here the learner's intention is to consult about a learning problem, where learning is the object. He or she picks up an appropriate tool that best mediates the thought.
What is a learner's reason for communicating using a particular tool?	...Depends on how desperate I am, if desperate I phone, if not I SMS. ...Depends on what I want to say ...It depends on the situation at the time ...Depends on the seriousness of the situation ...Availability of funds ...Economic limitations and time available ...It depends on where I am at the time that I need to contact them.	The experiences show evidence of the learners' situation as awareness of context. Location, cost, need and reason to interact are taken as context awareness which influences how learners consult each other, e.g., calling will give immediate response.

How does a learner decide which method of interaction to use?	...With email, it's efficient because I can phrase the issues better and they can review and reply with specific and thorough answers. ...It depends on the issues I need to discuss or message I need to get across. ...How they will respond. ...With SMS and calls, the response is faster and I can get help I need in time. ...It is the fastest way to get feedback from them. ...Whichever will reach the fastest in terms of being seen by the person, and the immediate need. ...It's quick and direct (*Mobile phone calls*). ...They are always with them (*peers always carry their cell phones*) ...I know they will always have their cell ...Depends on if they are available, and what will be quicker at that moment. ...If they are available (via mobile phones)	Learners use content of the interaction as context for which a mediating tool is chosen. Learners decide on the method of interaction with peers based on how quickly and fast they need the response. Where a short message is enough for the interaction, they text each other. Issues of time are noted as an influencing factor in picking a mediating tool, noting that most interactions are done on-demand to solve a learning problem instantly. Learners use social presence awareness as an influencing factor for choosing a specific mediating tool.

Table 4 shows how learners are conscious or aware of the situation and the context in which they are interacting with others, e.g., how fast they would need the response, the content of interaction, etc. It also highlights how presence and availability help the decision regarding how to communicate. The different mediating tools offer different opportunities and accessibility.

Table 5. How does location as context awareness influence the social interaction?

Researcher's Intention	Different Learners' Response/Experiences	Researcher's Comments
From which locations is a learner willing to contact his/her peers for a learning task or problem?	...Home, library, hospital ...UCT – basically anywhere on campus ...Only at UCT ...Everywhere ...Malls ...In the lab	Learning tasks and problems are not confined to fixed locations, thus learners could consult about a problem from anywhere.
If a learner wanted to interact with a peer, how would s/he consider a peer's present location?	...If they are in a lecture or the library and I have a small issue then I won't bother them. In essence, I would just take into consideration my need to contact them and their availability in terms of what they're doing and where they are. ...If they were on campus or at the library or maybe at home, I'd feel free to contact them since they will probably be more flexible and relaxed to respond.	Learners use awareness of location to determine if the peer's location favours a social interaction.
How does a learner's knowledge of where a peer is (their location) affect the social interaction?	...Makes it easier because you would know who is closest to you for help ...It would be great to know if they are nearby, but if they're not anywhere where I can reach them, then I'll have to call regardless of where they are. ...The closer he or she is, the better, because it will be easier for me to go to her when push comes to shove. ...If I knew they were in a club or something, I wouldn't bother them with school work.	The experiences show that awareness of a peer's location would determine if it is plausible or would make sense to consult a peer.

To what extent does a learner consider the distance between him/her and the peer before seeking help – does the sense of distance have an effect on who they communicate with?	…I'd consider the person who knows the most first, who is more likely to be the one in my area. …I consider how far away or close they are to me all the time …yes, the one closer you can interact face-to-face get better help as opposed to the more expensive calling or SMS. …The further you are, the less likely I am going to bother asking for help. …They must be closer to where I am	These support the theories of physical and electronic proximity (Corman, 1990; Johnson, 1992; and Rice, 1993) discussed in chapter two. Proximity facilitates the chances of social interaction by increasing the probability that learners will meet and interact face-to-face.
What other information about the learners' situation (in addition to location) is a learner willing to share with peers?	Only that I'm free/busy/not to be bothered. Just so that even if it says I'm at home they can know that it doesn't mean I'm resting or free for visitors and if I'm in the library doesn't mean I'm studying, I could be checking mail & available to hang out and chat.	The implication is that a learner's awareness of location should go along with the awareness of, for example, whether a peer is merely present but not available for a social interaction or vice versa.

Table 5 shows how learners use awareness of location to influence how they interact with peers.

Table 6. How does culture and social background as context awareness influence the social interaction?

Researcher's Intention	Different learners' responses/experiences	Researcher's comments
Does a learner prefer to get help from someone of the same: i) age, ii) gender, or iii) cultural background. NB: Learners ticked one that applied to them and justified their choice.	To most learners, cultural background came out to be more important than age or gender, although most male learners said they prefer getting help from other male learners than from female learners.	Comments after the table

Who is a learner most likely to communicate with, between a classmate with the same cultural background and a classmate with a different cultural background. NB: Learners ticked one that applied to them and justified their choice. *Most learners said they prefer a classmate with the same background because:*	… We understand each other better …It's better doing things with a black guy than white if you are black – u don't want to be discriminated …We have things in common which makes interaction more comfortable. …Then we can speak the same language …Classmate with the same background is easier to approach … Able to communicate well together & probably have same routines …Understand each other … There is not much to say to people of other cultures in Cape Town, but in Johannesburg I would communicate to any person.	Comments after the table

The last response, notably, shows again how context awareness influences interaction decisions. The learner would feel comfortable talking to any learner regardless of his or her background if she was in Johannesburg, a city more racially integrated than Cape Town. This shows awareness of location as context, where a learning activity possible in one location becomes uncomfortable in the other because of the social dimensions. The responses show evidence of how historical and cultural dimensions influence a learning activity. From the Activity Theory perspective, activity is a historically and culturally developed phenomenon.

Asked to what extent they (learners) would interact with another learner if they know s/he speaks the same language or is involved in similar learning activities, the respondents said *most often*. But then most said they would *hardly* interact with a learner who is in a different faculty "*Simply because it's harder for us to find common grounds and time".*

The above scenario talks very well to the Theory of Homophily (discussed in chapter 2). Communication scholars (e.g., Ibarra, 1993 &1995; Carley, 1991; Marsden, 1988; Coleman, 1961) have consistently found an interest in the principle of homophily as a theoretical mechanism to explain the evolvement of social networks. Homophily Theory suggests that social interaction is more likely to occur among learners who share similar identities and foci, including being involved in similar learning activities.

Table 7. How does a peer's activity and emotional state as context awareness influence social interaction?

Researcher's Intention	Different learners' responses/experiences	Researcher's comments
How would knowledge of what a peer is doing (current activities) affect a learner's interaction decisions?	...Issues like a person sleeping or eating may make me wait a while. ...I need to know if they got my full attention ...If sleeping, I will leave them be, if studying will interact with them ...Would respect that they are really busy and seek help elsewhere	A peer's activity influences the decision about whether to consult with that learner or consult with someone else.
How do actions and behaviours of others affect a learner's decision to learn?	...I am motivated by seeing others work and tend to slack when others aren't working ...When others are discussing work, it increases chances of grasping concepts. ...It doesn't affect me much, because we all have different learning	Presence of others, that is, seeing what they are engaged with influences the decision of a learner to get involved and do the same. For some, what others are doing does not influence their decision to work

How do actions and behaviours of others affect a learner's decision to learn?	capabilities. ... I take seriously any feedback or advice from learners who have done courses I'm doing. ...If am studying and people are noisy, I will not be able to concentrate. If they are serious, I too will be	
To what extent do emotional states of a peer affect a learner's actions?	...Very little, unless they're my friends and I am concerned, or if it's group work and they're slacking due to moods. ...You know what you can ask and can't, their moods may limit your questions. ...Lets you know how to approach them	Learners could be sensitive to the mental state of a peer thus altering the way they consult.
How does the awareness of a peer's current emotional situation (e.g., s/he is stressed, happy, sad, cheerful, etc.) help in interacting with them?	...Very helpful, you don't want to interact and learn with a sad guy, so they ought to be happy, cheerful. If anything they can be stressed. ...It's useful in the sense that I can know whether to bother them or not. It makes little difference in group work unless their 'situation' is very serious. ...It makes me understand their behaviour and the way in which they react to my questions or experience. ...It makes me understand them better and assist in determining what things I can or cannot say. ...Will try to approach them correctly, depending on what kind of mood they are in.	The experiences of learners suggest that emotional states and activities of peers do influence a social interaction. The awareness determines how learners approach their peers for a learning purpose. In the Activity Theory perspective the emotional states could be regarded as signs and rules, thereby altering the context in which a learning activity happens. Although these are unwritten signs and rules, learners know not to disturb or pester a peer who is not in the best of emotion and spirit to help with a learning task.

Table 8. Where and when does knowledge transformation most happen?

Researcher's Intention	Different Learner's Response/Experiences	Researcher's Comment
When does a learner experience most learning or when does a learning experience best happen?	...During working alone at residence or flat ...During interaction with peers within campus ...During interaction with peers at residence or flat ...During the lecture /scheduled labs	These suggest that knowledge is transformed in varied locations and at any given time. In other words, transformations are not restricted to particular times and locations. But importantly most learners said they learn best during interaction with peers.
Where do most of the learner-to-learner knowledge exchanges or sharing best take place?	- learners said it happens mostly where and when there is: ...Interaction with peers within campus ...Interaction with peers at residence or flat	This suggests that learners begin to reflect on a learning task and problem mostly in semi-formal and informal learning contexts rather than in formal settings. Learners are most comfortable exchanging knowledge and helping each other in informal settings rather than in formal settings. In the informal settings, learners mostly interact with learners with similar cultural background where they could use their mother tongue languages.

Table 9. How do environmental situations as awareness of context influence learning actions?

Researcher's Intention	Different Learners' responses/experiences	Researcher's Comment
To what extent is a learner aware of his/her surroundings, during a learning activity, and how does that influence his/her decision to interact with peers?	...Temperature, I don't like studying alone when it's too cold so I normally chat a lot when it's cold. ...The time of the day determines when I need to chat or where I need to work. ...Noise, too much movements, then I can't concentrate on my work. ...When I talk I can tell who is an understanding person from a lost one. ...When I am with people I am not so aware of my surroundings in the sense that I am when I am alone, however, it is when its silent and cold that I tend to SMS/call people with my problems. ...If I see a lot of other students studying and discussing with their friends, they keep me motivated and I ask them questions.	The environmental context and situations do influence how learners act and how a learning activity happens. The temperature during the day or ambience or noise levels may help a learner resort to a different learning activity. For example, a learner saying that she prefers to do more social interaction than studying in isolation when the temperatures drop. A learner consults with peers, taking advantage of their social presence and current activity.

Table 10. What is the role of Social Presence Awareness in the Knowledge Transformation Activity?

Researcher's Intention	Different Learners' responses/experiences	Researcher's Comment
How is it important for a learner to know a peer's availability before he/she decides to interact with them?	Very important	Awareness of social presence or a peer's availability is very important for interaction decisions
How does awareness of presence influence a learner's learning action?	...It helps me determine who I can get assistance from ...Puts me at ease since I know my friends could help when I get stuck ...I know I'm going to get help ...If they are available and willing to help, I will contact them. ...I have a choice to pick any depending on who is more knowledgeable on that particular topic. ...I know when my academic questions arise I'll be answered with certainty ...Then I could reach them whenever I need them ...It makes learning very easy, we could exchange ideas and information anytime and I will know that I am always able to ask for help	Social presence of knowledgeable peers is important for interaction whose purpose is sharing knowledge experiences. Learners are consciously at ease when they know their peers are available to help with a learning task, at anytime. Knowing a peer is socially present (awareness of social presence) gives a learner a sense of having a personalized academic support that "follows" them regardless of a learning problem and their location.

How is a learner able to keep the sense of presence during a technology-mediated interaction, particularly when using text-based instant messaging.	...Make the messages as short as possible ...Instant or quick responses ...I don't want to wait for a response to my question, which is why I use IM.	Short, quick and instant responses grab a learner's attention in a text-based social interaction.
How is a learner able to read emotions of peers during IM interaction and how can s/he sense if the peer is interested in talking to them or not?	... Words – descriptive uninhibited words ... I know when they have something else in their minds ... One word answers would indicate that he isn't keen to talk. ... The level of response and language used (enthusiasm) ... If they are keeping their replies short, they are usually busy or not interested	Even though they are not in the same location, learners are able to exhibit social awareness levels during a mediated social interaction
How is a learner able to show emotions in a text-based mediated-interaction?	...Word ("hectic" words) ...Smiley's ...Emoticons ☺, ☹ and abbreviations, e.g., lol (*lol is laughing out loud*) ...Icons and things like exclamation marks ...'Facial expression' - emoticons	Comment after the table
To what extent does a learner experience that s/he is sharing knowledge (that is, the interaction is helpful) during the instant message interaction?	...A lot; its fast. ...When there is progress. ...When the questions are answered in full without restrictions from the device. ...When I begin to understand, otherwise I keep asking.	Social interaction that results in knowledge transformation can still happen in a technology-mediated interaction as much as during face-to-face consultations.

Text emoticons, also called 'smilies', refer to the unusual use of text to create a visual representation of a mood which can be plain keyboard characters such as :-). Simple graphic emoticons like "☺ "cover the same emotions as the text emoticons do. For example, if a learner is happy with a learning decision or idea, s/he might send a smile icon with the message. Emoticons may serve as non-verbal surrogates, suggestive of facial expression, and may add a paralinguistic component to a message (Derks *et al.*, 2004). They enhance the exchange of social information by providing additional social cues beyond what is found in the text of a message (Thompsen & Foulger, 1996).

The next section looks at the questionnaire data through the Activity Theory lens.

5.2.2 Using Activity Theory to Analyze Questionnaire Data

As previously noted, in chapter three, Activity Theory (AT) is not actually a theory as such, in that it is not a fixed body of accurately defined statements (Kuutti, 1996). AT is a collection of broadly defined concepts that are open to interpretation. The analysis that follows is thus my interpretation of the key concepts that have been on the whole pertinent to this research and helpful in providing an explanatory framework for the data.

In a mobile learning environment, the central activity is learning where peers provide personalized social support through social interaction. The objective of the qualitative questionnaire was to draw experiences from many UCT learners with different social and academic backgrounds. The questionnaire queried learning contexts, conditions and elements that could influence social interaction whose outcome is knowledge transformation.

5.2.2.1 Unpacking a Learning Activity: Action vs. Activity

The study focuses on social interaction with peers and with the environment since individual actions can only be understood through the activity which they are part of (Leont'ev, 1978). In the study, *activity* is a set of mediated learning actions on a shared object by a number of learners, focussed by a context aware jointly aspired knowledge transformation outcome. Thus, the learning and knowledge activity is analyzed as a systemic activity involving social awareness of others, means of interactions, and conditions. Leontiev (1978) introduced a three-level model differentiating between non-conscious *operation*, individual *action* and collective *activity* (Table 11).

Table 11. Three levels of activity (Engeström, 1999; modified).

UNIT	DIRECTING FACTOR	SUBJECT
Activity	Object/motive: *Learning*	*Collective*
Action	Goal: *knowledge transformation*	*Individual or group of learners*
Operation	Conditions: Context and Social presence	*Non-conscious*

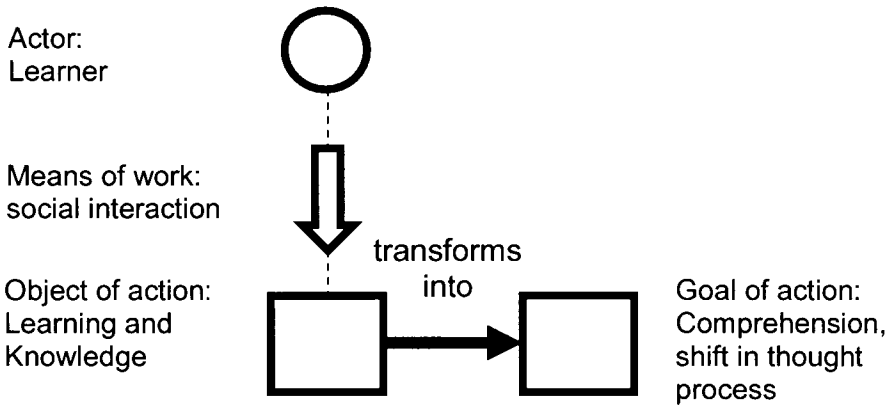

Fig 17. Individual learner action (Korpela et al., 2004: modified)

In figure 17, a learner, also called a subject, uses context and social presence (social awareness) to engage in a learning action, which is done in isolation or through social interaction with others. As s/he acts on an object or engages with a learning material, the knowledge is transformed whereby a learner has enhanced comprehension or a shift in thought process.

Activities, Actions and Operations of a Mobile Learning Activity

Activities consist of specific goal-directed actions, which in turn constitute operations, the routine, automatic processes that enable the goal (knowledge transformation) of the action (social interaction) to be reached (Leont'ev, 1978). Actions are achieved through the use of social awareness (i.e., awareness of context and social presence), which represent the 'conditions' of the activity. The conditions of the activity determine the operations that are used. Operations are not characteristically available in conscious awareness (Nardi, 1996) so

learners more often than not do not have to think about those operations, for example, using a mobile phone to send or receive a message or consulting with a peer with a shared cultural background. When learners do have to think about an operation, however, it stops to be an operation, and instead moves to the level of a learning action.

In a mobile learning environment, some of the learning actions contributing to the learning activity include reading and writing text messages, determining or selecting an appropriate knowledgeable peer based on the learning context and social background, face-to-face interaction with peers (discussing the course materials with other learners), and so on.

A learning task becomes a shared object of activity and through processes and actions the outcome of activity is knowledge transformation or improved comprehension of a learning task (Kekwaletswe, 2007). When studying collective work, the unit of analysis must be activity as a systemic whole, not any of its constituent parts in separation. The elements and the relations between them constitute the checklist for a researcher trying to grasp what an activity is (Korpela et al., 2002).

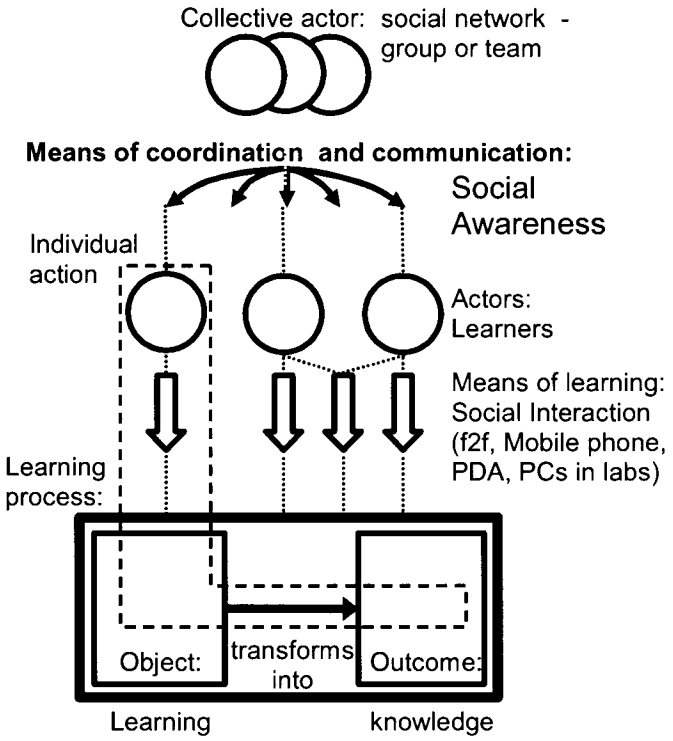

Figure 18. Elements of a learning activity system (Korpela et al., 2004: modified)

Figure 18 shows elements of a collective learning activity as a systemic entity. According to Activity Theory the motive of a collective activity is in its shared object – or more explicitly, in what the object (learning) transforms into during the activity, i.e., the outcome. In this case study, the motive of a ubiquitous mobile learning activity is to transform the social interaction 'answers' into improved knowledge. That is, to provide or be provided with a personalized academic support that leads to improved comprehension of a learning material or shift in the thought process.

In a mobile learning environment, individual learners engaged in the activity may or may not be aware of the collective motive, although the shared knowledge or learning experience and its transformation into the collectively produced outcome define an activity. Learners perform their individual actions of learning on the shared object (learning) through

mediating instruments or means of work that include language, experience, text and mobile technologies (mobile phones, PDAs) through social awareness (Kekwaletswe, 2007). For instance, a learner sends another a text message (SMS or IM) in order to provide an instant on-demand support; a learner uses his/her mother tongue language in order to better support a peer who is not conversant with the English language but shares a social background; a learner phone calls another in order to share the just announced change of a test date; learners use Microsoft® Word in order to transform their discussion and research results into a term article. The means of work may or may not be shared by learners.

The individual learner actions, taken together, form the process through which learning (object) is transformed to knowledge (outcome). Consequently, to map the individual actions into a collective activity, there is a need to have some kind of coordination between them – mediated by the means of coordination and communication. In a mobile learning environment these include aspects that impact learner social interaction; for example, location, environmental condition, situation and presence of a learner or peer, culture, time constraints, mobility and devices, etc. – collectively referred to and signifying social awareness or awareness of context and social presence (Kekwaletswe, 2007).

In essence, the learners as the collective actor of the activity operate through social awareness on the other elements. The means by which the individual learners act upon the object (i.e., the means of work or social interaction) can also mediate the relations between learners (i.e., the means of coordination or social awareness) – for example, a text or instant message is both a means for a learner in acting upon a learning material, and also mediates social interaction among a group of peers. The use of text emoticons communicates and coordinates emotions of learners (mediates context and presence) which, in a way, enhances the

exchange of knowledge by providing additional social cues beyond what is found in the text of a message, as a means of learning (*op. cit.*).

5.2.2.2 Conclusion on the Questionnaire Data Analysis

The questionnaire data analysis indicates that although learners may or may not be in the same location, they use context and social presence awareness (social awareness) as a means to interact and consult with a peer. Their motives (learning) and goals (to transform knowledge) are realized by using mediating tools like text via instant messaging and SMS or voice through mobile phones, where peers are not in the same location. Instead of being a process of knowledge transmission, in a mobile learning activity, knowledge is socially constructed based on the intentionality and social awareness used in the process.

The interaction context changes depending on the purpose for consulting and the subsequent tool used. For example, in textual interactions learners use emoticons to show emotional state, etc., thus maintaining intimacy and immediacy, constituting social presence. As a means of communication and coordinating a learning activity, learners use social awareness to determine the means of work including which language to use, who to consult with and the appropriate mediating tool, e.g., email, SMS or face-to-face.

The qualitative questionnaire data analysis showed how elements of a learning activity system – collectively referred to as social awareness – fundamentally influence a learning action and process in a ubiquitous mobile learning environment, where the goal is knowledge transformation. Evidently, social presence and context awareness is used as means of coordination and communication. As outlined in the analysis tables above, elements of social presence and context awareness discovered in the

questionnaire data included mediating tools for learner interactions, location of learners, culture and social background, activities of peers and their emotional status, places where learning most happens, environmental situations, and awareness of a social presence.

The mobile Instant Message learning activity (social interaction of learners) in a ubiquitous mobile learning is analyzed and discussed in the next section. Since the questionnaire enabled me to gather experiences from a fair number of learners, I felt that it was not necessary to have a similar number of Mobile Instant Messaging (IM) participants.

5.3 Mobile Instant Messaging Data Analysis

Activity Theory requires that the researcher develop a complete understanding of all forces impacting the system and the changes in activity systems over time. Learning activity is a process often consisting of different actions, steps or phases. For me to see out all these steps or phases there was a need to use a varied set of data collection techniques to elicit a complete picture of the activity system. To this point, this research employed the mobile instant message technique – where learners exchange learning experiences and knowledge in a textual form – as another element of the learning activity system.

Fig. 19 Mobile instant message activity where learners who are not co-located interact using text as means of work.

For the reason that the learning actions in an IM environment are focused on text and the interpretation of it, the application of Activity theory in analyzing IM data is not the same as in the previous section. The analyses are focused on social awareness exhibited in the IM textual conversations.

5.3.1 Introduction and overview

In this section, I analyze situational learning activities in the form of textual social interaction between learners. The activities were situational in that they were not predetermined or planned with the learners. The Jabber server logged text interactions as they happened (in real time) so that an action was captured in an authentic learning context, regardless of location and time. The IM learning activity was experienced by learners who used Wi-fi enabled PDAs installed with *imov* messenger (a mobile IM client) to interact with others who were not in the same location. .

All mobile instant messaging actions took place where there was access to UCT wireless hotspots or near the temporary ones I had placed in select residence areas. Although a total of 20 learners participated with PDAs at various case study periods resulting in numerous pieces of text logs, the IM text data analyzed in this section concerns only five learners. The learning activities analyzed involve interactions between Molefi and Pono, Pono and Hazel, Neo and Mmoloki (pseudo names). The reason for analyzing only their activities is that the text logs presented a more meaningful and cohesive learning interaction that happened over an elongated period compared with others (which were logged at shorter periods and in smaller bits and pieces).

For purposes of analysis, the text logs have been re-formatted from their original Web-based presentation to an easy to follow and read Microsoft®

word format. The captured text logs were transcribed and are provided in the appendix.

In analyzing the IM text data, I attempted to understand how knowledge transforms during a learning activity mediated by means of a mobile instant message text. The objective is to understand what takes place when effective text communication happens. That is, the process of coming to know where a learner in an IM learning activity can be said to understand another learner's "knowledge" communicated through instant text. To help understand the analysis, let me briefly re-cap – from earlier discussions in chapter 2 – what constructivists often mean by the terms "learning" and "knowledge", since both learning and knowledge are what motivates and forms a knowledge transforming instant messaging.

Learners learn intentionally by consciously setting themselves goals to be achieved, i.e., for their knowledge to be transformed. As a natural adaptation, "learning" happens incidentally in the context of the pursuit of current "need satisfying" goals, and consequently "learning" as a process of adaptation is going on all the time, therefore, one cannot not learn (Scott, 2001). In an IM social interaction, textual exchanges do not "transmit knowledge", rather they provoke participants into becoming informed of each other's "informings." When people learn, they are said to acquire "knowledge", so that "having knowledge" is understood as a process of knowing and coming to know (*op. cit.*, p348).

Mobile learners who participated using the PDAs had opportunities to take advantage of social presence awareness of peers, availed through the IM presence indicator, to engage in an on-demand and spontaneous learning activity. These allowed them to be informed of each other's "informings" through textual exchanges.

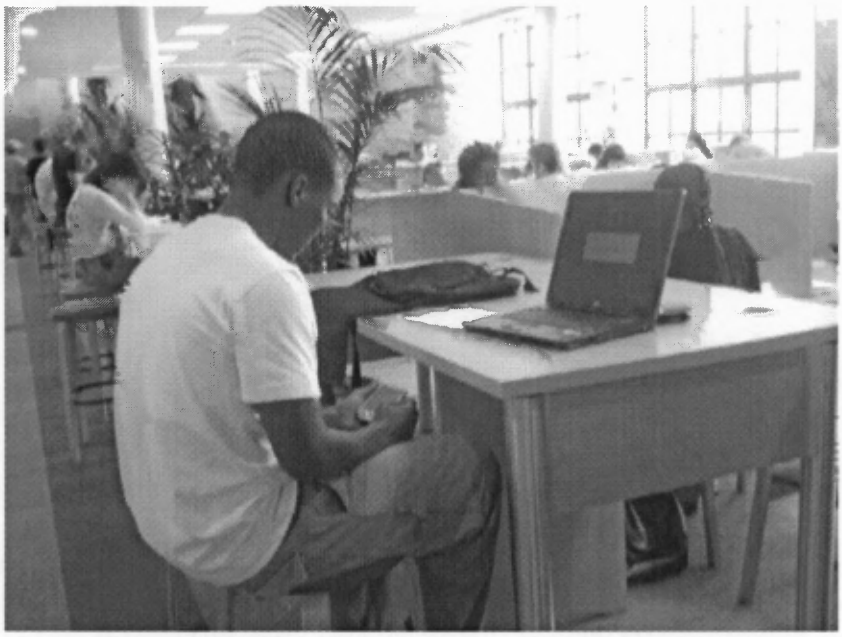

Fig. 20 Semi-formal learning context: A mobile learner in the university library interacting with a peer through mobile instant messaging.

The following are selected learning activities as they happened during various days of the case study period.

5.3.2 Mobile IM Learning Activity One

The following is a snapshot of a social interaction between Molefi and Pono. The activity happened on October 19th, 2006. Molefi and Pono are classmates, apparently working on a research term paper.

Message from	Message to	Message content
Molefi	Pono	Sup, wher r u now?
Pono	Molefi	nuttin much, am in my room at res. d we stil hav dat meetin?

Molefi	Pono	yeah as far as i know
Pono	Molefi	I meant wit Prof Loeto abt our paper. it is tmr at 9am, rite?
Molefi	Pono	actually it is at 9:30
Pono	Molefi	Oh, thanks!!

In the above interaction, Molefi is aware of Pono's presence via *iMov messenger*, the IM client. He then initiates an interaction with a greeting common between them: "What is up" or *"Sup"* for short – language context is useful as a tool or means of action. In the same line he wants to know where Pono is, perhaps to see if he is available and in a favourable location for the interaction. So awareness of Pono's presence and location is important. The learning activity then begins with Pono trying to confirm a time for a meeting with their Professor. As part of context awareness, the time factor impacts a learning activity.

Message from	**Message to**	**Message content**
Molefi	Pono	what did Prof say? did he like it?
Pono	Molefi	he says to add bits abt BEE stuff, dnt know wat dat is
Molefi	Pono	oh? I guess that makes sense. It is South Africa after all. I sometimes forget stuff like that

Pono	Molefi	wat exactly is BEE? wat does it stand for n wat does it involve n stuff ...:-)
Molefi	Pono	Are you asking me? Black Economic Empowerment.

The motive and context for their interaction is established by what their professor had asked them to add to their paper, a section about Black Economic Empowerment (BEE). Pono is aware that he lacks understanding of BEE. In that way, Pono is the learner who seeks to acquire knowledge about the BEE subject matter – therefore, the social interaction (learning activity) is about the process of knowing and coming to know about BEE. While still interacting with Molefi, Pono became aware of Hazel's presence (via the IM client), thus, he concurrently consults with her. Their interaction, Mobile Learning Activity two follows below.

5.3.3 Mobile IM Learning Activity Two

Pono's concurrent consultation with Hazel, logged on 19th October, 2006 happening at the same time as mobile learning activity one.

Message from	Message to	Message content
Pono	Hazel	Hey, where r u now?
Hazel	Pono	Am in the library
Pono	Hazel	Gud, since u r arnd enuff info, perhaps u can help us wit sum BEE stuff for our paper

Hazel	Pono	may be I can help, what exactly about BEE? what do you need help in?
Pono	Hazel	R u aware of d BEE n how it is done in dis country?
Hazel	Pono	well, am not sure, will ask for help at commerce help desk and see what I can do. will definitely make a plan. give me couple of hrs
Pono	Hazel	how long r u in d library for? I mite come up der
Hazel	Pono	will be here till i chunk out. would be cool if u join me. i'll continue to find out stuff on BEE though.

In the interaction, Pono is still in pursuit of acquiring knowledge (knowing) about BEE. Hazel is not an outright knowledgeable peer on the subject matter. But Pono, with awareness of Hazel's location (library as context) reckons she could still find information for him on the matter. By the same token, Hazel's awareness of location context (where she is) informs her that she can consult the commerce helpdesk with the BEE learning problem. The two learners then agree to meet at the same library because Hazel will maintain her presence there for a while. Since Pono is not asking for directions or which library Hazel is at, I can infer that they both previously met there, and therefore have similar awareness of the library context. Social awareness is evidently used here as a means of coordination and communication.

Meanwhile, mobile learning activity one – Pono and Molefi – continued on the same subject matter, BEE.

Message from	Message to	Message content
Molefi	Pono	They are trying to redistribute wealth to those that were "previously disadvantaged"
Molefi	Pono	It's kinda cool actually. Never seen such a comprehensive affirmative action program anywhere
Pono	Molefi	affirmative action, d u mean like in d US?
Molefi	Pono	Kinda, but much more involved.
Pono	Molefi	how r dey distributin wealth n to who?
Molefi	Pono	in the US it is just if you are a minority and you have the same qualifications as a white person when applying for the same thing then you should get it
Molefi	Pono	in south africa there are quotas of how many 'black' people should be in every organization
Pono	Molefi	Quotas?...as in % of positions dey shud have?
Molefi	Pono	Yes that is it, priority is given to 'blacks'

Pono	Molefi	wat if no black citizen qualifies, wat happens?
Molefi	Pono	you may get black non citizens i think but I am not sure
Pono	Molefi	so BEE is abt helpin black people catch up, I see.
Pono	Molefi	r u at Res? I need to give u d doc so u can add stuff
Molefi	Pono	i'm on campus right now by the stats tutors office
Molefi	Pono	got to concentrate on my stats test coming
Pono	Molefi	ok, I will let u do ur stats now. let me finish wit my cookin
Pono	Molefi	so when d we get to meet so we can go over stuff b4 Prof meetin
Molefi	Pono	don't know 8, is 8 cool?
Pono	Molefi	I shud b on campus then, I guess we meetin at d usual place
Molefi	Pono	Sounds like a plan
Pono	Molefi	hey gud luck wit ur stats, got to deal wit dat comp sci projct, u probably did it last year , so mite bother u again tmr

Molefi	Pono	might want to reconsider that, did not do too well on it
Molefi	Pono	well got go now, will catch up with u later.
Pono	Molefi	aight, c ya later. Thanks!

Pono has yet to grasp and know the BEE concept and how it is applied. The context of asking for help with the topic is need driven, where he needs the knowledge of BEE in order to fulfill a current learning motive and goal, in terms of writing and completing a term paper. The context for which the learning problem situation arises is important. Here, Pono seeks knowledge in response to a learning task and situation he faces. The awareness of Molefi's social presence enables the social interaction whose purpose is to transform his knowledge.

The learning activity (acts and processes) is characterized by typing instant messages back and forth using a Wi-fi enabled PDA. Pono asks what BEE is and Molefi offers an explanation of what it is and why South Africa has such policy. In trying to explain the "what" and the "why", he draws from prior knowledge of the almost equivalent policy in the USA, Affirmative Action (AA). The affirmative action context and situation, which Pono is apparently aware of, helps his current understanding. In other words, the BEE topic is related to the AA history. Molefi then proceeds to explain how it is done and the differences. The BEE conversation ends with Pono's initial knowledge state changed as a result. He now has an overall understanding of BEE as designed to "help black people catch up."

Satisfied with the transformed knowledge (understanding), the interaction shifted to the next learning action. That is, the actual improving of the paper and their meeting with their Professor. Evidently, social awareness (location, time and the paper context) coordinates their social interaction.

Molefi has to end the interaction cognizant of the fact that he still has to study for the statistics test, which shows awareness of time as context. Pono figures he could use Molefi's social presence as an opportunity to solicit help with his other learning task, a computer science project. Mobile instant messaging allows for spontaneous and opportunistic social interaction.

5.3.4 Mobile Learning Activity Three

The next learning activity involves Mmoloki interacting with Neo. They are both in the same information systems class. Like the previous activities, the interaction is need-driven in that Mmoloki is having problems completing her Database project. She seeks a personalized support from Neo, a knowledgeable peer whose social presence is realized through *imov messenger* (mobile instant message client) installed on a Wi-fi enabled PDA. The activity happened and was logged on October 17th, 2006.

Message from	Message to	Message content
Neo	Mmoloki	hi there so how is da studying?
Mmoloki	Neo	Slow and u?
Neo	Mmoloki	slow as well, so where are you?
Mmoloki	Neo	i'm in the lab and u?
Neo	Mmoloki	am in the library, want to study another module
Mmoloki	Neo	sounds like u r on a roll
Neo	Mmoloki	well I really want to pass this course

Mmoloki	Neo	i'm still stuck on the stuff about office space, can u help?
Neo	Mmoloki	yep what's the problem?

In the initial lines of the interaction, the learners start off by establishing each other's context in terms of how each is doing (health, perhaps even the stress level), their current activities, and location. Once there is social awareness (as a means of coordination and communication), Mmoloki articulates her learning problem. From saying "I'm still stuck on the stuff about office space" she gives the impression that they have both previously tried to solve the same problem, so that Neo should be able to understand the problem context and situation. The learning activity continues below.

Message from	**Message to**	**Message content**
Mmoloki	Neo	... login is giving issues. I was trying to fix the login but i'm stuck
Neo	Mmoloki	hey, what's the error?
Mmoloki	Neo	its not getting the employee details from the emp table
Neo	Mmoloki	but is it populating at all?
Mmoloki	Neo	No, thing is I have an emp table & a userlogin table and I dn't know how to integrate the 2
Neo	Mmoloki	try make sure u normalize ur tables

Mmoloki	Neo	How?
Neo	Mmoloki	there shudnt b similar data in da tables
Mmoloki	Neo	Oohhh, maybe that's what the problem is
Neo	Mmoloki	also enforce referential integrity when u build relationships
Mmoloki	Neo	I think I have redundant data in both tables
Mmoloki	Neo	oohh now I get it
Neo	Mmoloki	ok try sort it out n let me knw
Mmoloki	Neo	Okay thanks
Neo	Mmoloki	Cool, later then!
Mmoloki	Neo	Woa! Hey, I think its working now
Neo	Mmoloki	great, at least we seem to be getting somewhere ... :-)

In the above interaction, Mmoloki cannot figure out why her database is not functioning as it should. She consults with Neo who initially needs to understand the problem situation and context before she could share her knowledge and experience. This context awareness is necessary in order to address learning problems appropriately. Once she understood the situation and context, she moved on to offer the "how" explanations. Mmoloki tries what Neo suggested and eventually she is able to resolve the learning problem she faced. Through awareness and social interaction with a peer, Mmoloki's knowledge was transformed.

5.3.5 Conclusion on Mobile IM Data Analysis

The IM learning activity and process include accessing a wireless network through a PDA. Once the wireless network was accessed, a learner logged on to the mobile instant message (*imov* messenger that has a presence indicator). Using social awareness, a learner identifies the relevant social resource to consult with for a learning topic. The object of the interaction is the established topic. The learning actions and processes are depicted in figure 21.

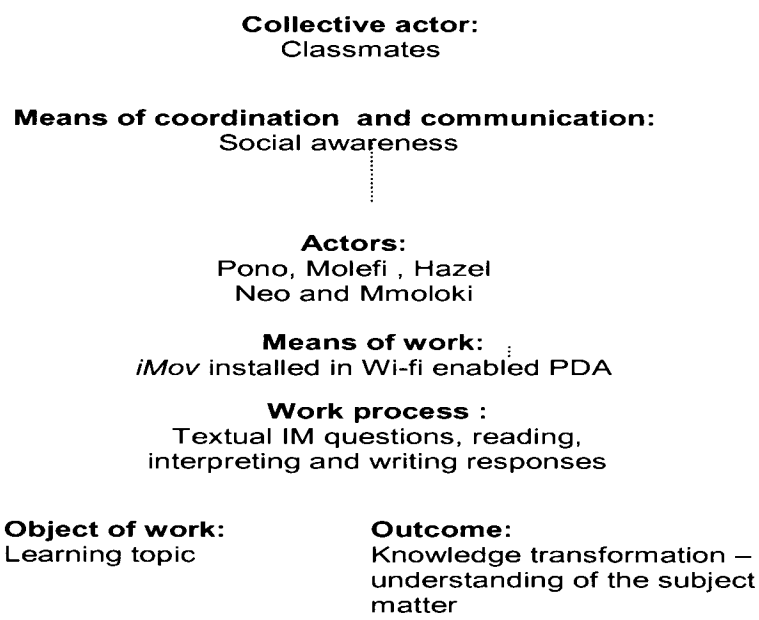

Fig. 21 An IM learning activity system: textual social interaction enabled by a wireless device (PDA)

Evidently, regardless of the fact that the learning activities were mediated using text as a learning process tool, social awareness was a means of communication and coordinating the interactions. The Mobile Instant Message interactions analyzed tend to exhibit what Stohl (2001) calls high-context-messages. That is, IM messages are highly contextual,

where most of the information is already in the person and the relationship while very little is in the coded, explicit part of the message (*op. cit.*). From the above three learning conversations, it is evident that the text-based interaction allows learners to take time to organize their thoughts before writing and that their messages tend to be more thoughtful, succinct and clear than spontaneous remarks made in the heat of a verbal discussion (Wright, 2003).

In the IM mediated social presence and context, the absence of verbal and facial cues in the learning activity allows learners to concentrate on the content of the message rather than the sender – an observation also made by Berge (1997). The perception by some participants in Berge's (1997) study was that written communication is more reflective than spoken. At the end of mobile learning activity three, Mmoloki uses the "woa!" word with an exclamation mark, thus helping to expose her excited emotion and a relieved state. Neo responds with the emoticon ☺ to show her glee, as well. As shown in the IM interactions, a learning activity (social interaction) facilitated through social awareness is as possible in a mediated communication such as instant messaging as it is possible during a face-to-face meeting.

Although the study did not intend to assess or measure how much knowledge is transformed during social interactions but to observe learning actions, it is evident from IM learning activity one and three that the interaction between Molefi and Pono, and between Neo and Mmoloki finished with positive outcome – Pono had a good BEE understanding while Mmoloki was able to complete the Database task, respectively.

In the following section I analyze observations of learning activities made at informal locations on the UCT upper campus.

5.4 Observational Data Analysis

5.4.1. Introduction

Activity Theory requires that the researcher develop a complete understanding of all forces impacting the system and of all the changes in activity systems over time, by immersing himself in the system under observation for the entirety of the process (McMichael, 1999). The analysis of the ubiquitous learning environment observations offers yet another understanding of a force that impacts a mobile learning activity system – the situational and spontaneous social interactions of learners outside the confines of the walls.

For purposes of the inquiry I opted to focus the observations on two learners – Molefi and Hazel – as they interacted with others and the environment. This option allowed me to have a much richer observation and description of authentic events as they unfolded. To this end, the two learners were followed and observed – with their knowledge and permission – as they went about their mundane activities on campus. The observations were done in an attempt to understand the phenomenon of learner mobility and their knowledge seeking situational actions, i.e., to capture the natural everyday life of a mobile learner outside the formal learning contexts.

Although the two learners, Molefi (male) and Hazel (female) were also participants in other mobile learning case units, they were observed by the researcher in real and authentic learning contexts. That is, no activity was pre-determined or planned with them. Since the observations happened in authentic contexts but at different times of the days, the two participants and I established and agreed on the times that they would be on campus and four locations on campus where the observations would be done during the case study period. At the agreed times, my task was to locate

the participants, making descriptive notes and often taking pictures (with the participants' consent) using my mobile phone camera.

In the next section, I describe UCT as the research site. This description or background is different from the one given in previous chapters, including chapter four, in that it gives the reader a sense of how the observation site looks in terms of buildings or physical layout. I also give the perception of the UCT mobile learners who navigate the campus.

5.4.2 The Background of the Research Site

Fig. 22 The University of Cape Town Upper Campus as seen from the Middle Campus. Table Mountain is in the background.

The University of Cape Town is located on the base slopes of Table Mountain. The main campus is actually divided into three regions referenced with respect to the mountain – upper campus, middle campus and lower campus, with upper campus being closest to the mountain mid section. The upper campus is, therefore, characterized by various long

and short flights of stairs that link up buildings as well as social spaces. The upper campus is also where most UCT formal learning takes place. That is, it is where most classrooms, several computer laboratories, department offices, the main university library, the student centre, etc., are located. One hardly walks on a flat surface, even for a few minutes, when moving from a departmental building to the next before walking up or down stairs.

For such a huge campus with varied height levels, the provision of shuttle buses that circumnavigate all campuses, residences, and off-campus University affiliated institutions, collecting and dropping students and staff alike, is inevitable. For most learners, shuttle buses are the only way of getting to upper campus classes and buildings.

5.4.3 The Background Perception of a UCT learner

The University of Cape Town is considered one of the top and prestigious universities in the continent of Africa, and in some respects is also considered highly by those in other continents as well. It is, therefore, not astonishing that most learners enrolled here regard themselves as the elite or as learners of high-quality. I asked participants as well as other learners I came in contact with, at the UCT upper campus, how they would fare in their studies if they were to transfer to other universities and the immediate pompous response was that they would do better if not exceptionally well. They alluded to the learning requirements and standards being much higher and stringent at UCT compared to other South African universities.

Since UCT learning requirements are perceived to be rigorous, participants and non-participant learners contacted on campus remarked

that interactions with fellow learners who can provide personalized assistance for a learning problem and knowledge sharing is a necessity. They believe it is almost impossible or hard to deal with learning assignments and tasks without consulting with fellow learners. The observational inquiry (related below) is consequently to understand how the UCT learners go about seeking and transforming knowledge by way of situational and opportunistic social interaction with fellow learners, who may be or may not be at the same informal location.

5.4.4 The Observations (thick descriptions)

The following section is a relation of the mobile learning environments within the UCT upper campus (varied locations), as observed during the week of November 6, 2006. The main objective of the observations was to understand how aspects of context awareness and social presence play out and manifest by looking at another element of the mobile learning activity system through a careful and accurate exploration of the inherent or lived experiences of learners and the environment as I saw it.

The UCT mobile learning happens in varied locations. In the following section, the locations observed are labeled *mobile learning environment one, two* and *three* in order that the descriptions are specific to that particular time and campus location. That is, the mobile learning environment was time and location specific in that the same actions could not unravel in the same way at a different location. The UCT mobile learning activity system included the following:

5.4.4.1 Mobile Learning Environment One – The UCT Southside Shuttle Bus Stop

Fig. 23 Mobile learners interacting while waiting for or getting off the UCT shuttle bus at the Southside Shuttle Bus Stop

The following describes an opportunistic learning activity that happened when two mobile learners spontaneously met (face-to-face social presence) by the shuttle bus stop and engaged in a momentary social interaction. In *mobile learning environment one*, other learners were also observed socially interacting with the ones standing next to them or using mobile phones to interact with those in other locations.

(November 6, 2006). **9:17a.m.** It's a bright Monday morning with the weather situation promising to be a typical sunny spring day. However, this is Cape Town, so the situation cannot be trusted to remain smooth and warm all day long, notably with the upper campus sitting at the foot of Table Mountain. The blue shuttle bus emerges up the curve and gradually reduces speed until it comes to a halt at the Shuttle Stop located close to the new Chemical Engineering building. There are already a few learners (some with their text books open, some are talking to their mobile phones in varied languages) at the Bus Stop, waiting for the shuttle. Hazel, holding a colourful orange bag, grudgingly steps out of the blue shuttle bus using the front side door as many other learners make their way out of the same shuttle using the back side door. As she touches the ground, she looks up to see a 'familiar' friend. The two chat, in English, for couple of seconds and since the 'friend' kept pointing at the white papers she pulled out of her back

pack, I could only infer that they were talking about some academic matter (either questioning or confirming). The 'friend' puts back the papers as she steps into the shuttle bus.

Hazel walks down around the Chemical Engineering building down the staircase heading towards the Commerce building. She takes out a mobile phone from the pocket of the orange bag on her shoulders. After dialing some numbers she puts the phone over her left ear. Following what appeared like a no answer call, she pulls down the cell phone and start typing what I assume was a text message (SMS). She continues walking down the stairs, disappearing through the glass Commerce building doors by the time she finished "texting."

Fig. 24 A mobile learner using a mobile phone to receive and send a text message to a peer.

Social awareness and some contextual situations of particular interest were exhibited in the above observed learning environment. Firstly, the weather situation (it was sunny and not raining) allowed the learners to: a) stand by the shuttle bus stop, b) interact with others face-to-face (*ad hoc* meetings) while waiting or getting off the bus, and c) interact with others not co-located using mobile devices. Secondly, a quick spontaneous learning interaction between Hazel and the friend was opportunistically made possible by social presence awareness. Spoken Language as the

means of interaction also shows social awareness of learners with regard to others. Hazel used English to interact with her friend since they probably did not share a common mother tongue. Those talking face-to-face or over the mobile phones used languages they were probably most comfortable with, again showing awareness of the other party's context. Hazel also shows awareness of a situation by exploring an alternative means of work (text instead of voice). After failing to consult with a peer via a phone call, she used the same tool to consult but used a text message instead.

5.4.4.2 Mobile Learning Environment Two – The Cissie Gool Plaza

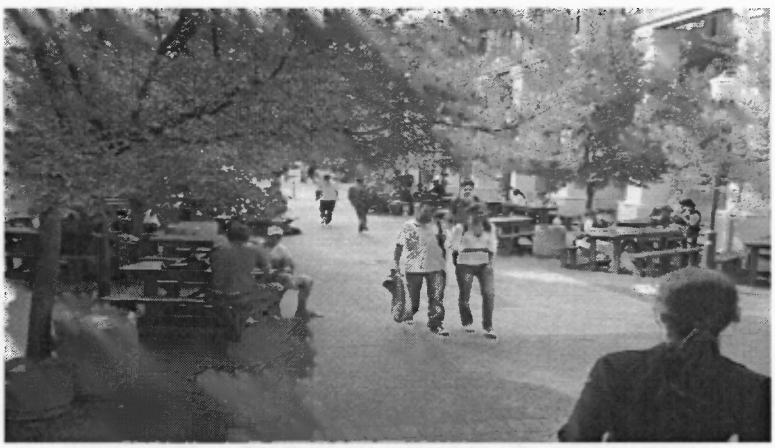

Fig. 25 The Cissie Gool Plaza

This outdoor location is unique in that the sitting tables were put out for learners to enjoy their food, drinks or snacks in between scheduled classes and other formal learning activities. All the same, it is a regular learning environment where learners converge to 'share' a meal as well as to share learning experiences. The following is the unfolding of social awareness in relation to learning actions at the Cissie Gool Plaza.

(November 6, 2006). **12:41p.m.** It is definitely warmer and brighter than earlier and so far the weather is affording those that love the outdoors the opportunities to sit out. I make my way down to Cissie Gool plaza, an outside open area adjacent to the Computer science department where learners typically sit and eat food bought mostly from Steers and other nearby fast-food stores. This day is typical, with several groups and lone learners either eating and chatting freely or engaged with books and other learning materials.

After several seconds of looking around, I finally spot Molefi, wearing a white sleeveless t-shirt and an old khakhi baseball cap, sitting at one of the end tables. He is eating and interacting with three other learners (one female and two males, all African) using the Tswana language. They have books and papers open on the table so this tells me that they are discussing some learning problems. On the same wooden table a PDA and two mobile phones rest. Apparently, the four learners are sitting close to a wireless network hotspot (one of the few on campus that Molefi is aware of from the mobile instant messaging pilots I did with them). While Molefi is playing with the PDA, he gets disrupted by his peer calling on a non-African 'friend' who happens to be passing by. The two mumble in English and after few seconds he sits down to join the 'discussion group.' The 'friend' is uttering in English while scribbling on a paper in front of Molefi's peer. Few minutes later, the new 'friend' stands up, grabs a handful of fries from a disposable white plate on the table and leaves the group after making his impromptu "contribution".

In the above learning environment, I observed that learners showed awareness of context and social presence in different ways. Firstly, the environmental situation (context), that is, the warm and bright weather and the ambience may have influenced their choice of holding the peer-to-peer informal discussions in that specific outdoor location. This kind of learning is situational even though they may have planned to meet. The sudden social presence of the non-African 'friend' was purely accidental but

nevertheless his action added to the knowledge transformation motive. Secondly, the four learners' awareness of their social context played a role in terms of the language of choice (Tswana) used as they reflected on the learning materials.

The Theory of Homophily is applicable in the context of having four African learners sharing learning experiences and knowledge. Similarity-attraction (racial and language backgrounds, in this case) is thought to ease communication, increase predictability of behaviour, and foster trust and reciprocity (Brass, 1995). When the non-African 'friend' jumped in, context and presence awareness allowed the social interaction to shift to English, switching back to Tswana after he leaves. The activity context (the learning tasks and goals) also played a role in the social interaction, e.g., in terms of finding a knowledgeable peer who can help, the African learner sought help from the passing non-African "friend" regardless of his social (background) situation. To this end, the Theory of Homophily may argue that the similarity was in terms of being in the same class or being involved in the same learning activities as opposed to race or social background.

It is now **13:08** The four learners continue with their discussion, often writing down, pointing at various learning sources (books, handouts etc.) as they exchange ideas verbally (using English and Tswana interchangeably). Every now and then Molefi skims through his PDA jotting down stuff. The female learner looks at her wrist watch, turns to others, picks and checks one of the mobile phones and starts to pack. She waves at a friend coming out of Steers as she walks away from Molefi and the guys. After several minutes, the three guys finish the discussion and clear the wooden table. While walking away from the discussion location, Molefi is a little quiet as the other two are talking blissfully. Molefi and a peer vanished through the Opperheimer University Library doors while the third

guy stopped by the ATMs not far from the library entrance and made a mobile phone call, after which he rushed out abruptly.

In the observation, above, Molefi's awareness allowed him to use a mediating tool, a Wi-Fi enabled PDA, to access resources. Molefi is using the PDA to either access online learning material via the Internet or the mobile IM client to access or interact with peers not in the same location. The co-located peers' social interaction was visibly influenced by awareness of time context. When the female learner checked her wrist watch, the current time made her aware that she would have to leave the informal learning discussions and probably set out to attend a formal lecture or move to do other activities.

5.4.4.3 Mobile Learning Environment Three – The Jameson Hall (Jammie Stairs)

The *mobile learning environment three* allowed me to further observe how social awareness unfolds and manifest in yet another learning activity at a UCT informal location, the popular *Jammie stairs*.

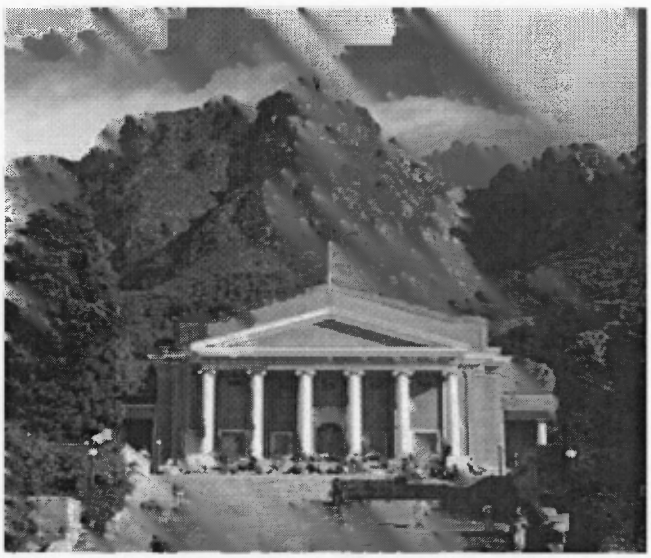

Fig. 26 Mobile learners interacting outside the Jameson Hall. The space is popularly known as the Jammie stairs

(November 9, 2006) **13:03** The flight of steps in front of the Jameson Hall commonly called Jammie stairs is a very popular spot for undergraduate learners, notably during the lunch hour on a bright warm or hot day like today. The popularity may be stemming from the fact that the area is the heart and centre of the upper campus. In addition, the Jammie stairs offer a picturesque view of the Cape flats and part of Rondebosch and RoseBank. Also, the stairs and the space below act as a socializing place and often as an entertainment stage for live bands and shows meant to enhance the campus spirit, mostly on Thursdays. Today though, there is no scheduled entertainment. Nevertheless, the place is still packed with socializing learners who are possibly waiting for their next lecture or have just finished a lecture or just there having fun. Taking a second glance at the crowd reveals that some learners might just be there to make fashion statements.

For learners who are there after a lecture or waiting for their next scheduled lecture or laboratory session, the *Jammie stairs* space also provides opportunity to reflect on learning materials either in isolation or by interacting with peers.

It's now **13:16**, and as I push my way through the animated learners, I observe varied pairs and groups of learners interacting face-to-face while some are on their mobile phones presumably SMS-ing or talking to remote friends. There are also several isolated learners with two or three of them using laptops. Molefi and Hazel, the two participants, are part of the crowd. Hazel is seated alone on the top second last step, to the left of the Jameson Hall double door entrance. She is reading a novel-like publication. Next to her is a grayish small book bag that kind of matches the pants she is wearing. It is not the colourful orange bag she had on Monday.

It's about **13:23** and I can see Molefi standing by the bottom pillar. He is conversing with other learners, apparently about the upcoming final examination schedule. His mobile phone rings from his front pocket and he takes it out telling the caller that they can be found at the bottom of Jammie stairs. The caller hangs

up and Molefi and friends continue with the exam schedule conversation. A male voice coming from the library side asks a group of socializing female learners if they are ready for the later exam. "No, sort of, but not any more ready than you, Greg" came a female response as the guy makes his way down to the bottom of the stairs. He looks around for a second and catches Molefi's hand waving to signal their location, which is only a couple of meters from where he is standing. Molefi, yet again, takes out his mobile phone from his front pocket and seems to be typing a message as the buddies vanish into the crowd.

November is an anxious month for UCT learners, especially for undergraduate learners, since it is the time when they take their end of year examinations. In this learning environment, context and social presence awareness is used by learners to identify and interact with friends in informal settings in preparation for the upcoming examinations. In other words, the Jammie stairs offer a social learning space to the mobile learners, affording them an opportunistic and situational consultation with knowledgeable peers. Given that the social interactions are so informal and relaxed, it makes learning and the transformation of knowledge easier and enjoyable. In this environment, learners interact with others face-to-face or use mobile technologies such as mobile phones to maintain their social presence with those not in the same location. Regardless of the means of social interaction, their views and perspectives may shift as conversations carry on, while at the Jammie Stairs.

It's now **13:41** and I rush up the stairs through a now fading crowd hoping to find Hazel at the same location. She has now been joined by a friend who is displaying some good multitasking skills, for she is typing an SMS with the mobile phone over an open document while still conversing noisily with Hazel about some exam she couldn't finish because she got "stuck with a stupid exam topic they skipped during last night's studies". Hazel smiles and says "well, I told

you guys, Prof likes the ERP tricky questions" as she puts her novel-like publication in the grayish book bag.

Hazel's friend uses her social presence to vent out the experience or frustration she had during the examination. From listening to these mobile learners' conversation, Hazel's comment and the friend saying they skipped the topic, it becomes evident that learners use the way a lecturer delivers his lectures or test questions (that is, what I call the lecturer's context) to anticipate and determine how and what topics or questions to prepare for. The lecturer's context stems from the learner's prior experience with the lecturer. In other words, the lecturer's personality and character as well as what s/he delivers during lectures (and how s/he asks questions in tests) influences what and how mobile learners transform knowledge – for example, in terms of studying and preparing for an examination.

5.4.4.4 Conclusion on the Observational Data Analysis

The social interaction observed in the three mobile learning environments was based on a shared learning objective which, through the learning process and actions, transformed into knowledge. When learning happens, historical learning phases, learning requirements, problems and possibilities all drive the learning activity. Learning activities are culturally and historically created and recreated. In Activity Theory contradictions are the driving force for change in activities. Relations between activities are also seen as mediated, e.g., it was examination period at the time of the observations, therefore changes in studying patterns and a time-driven rush to interact with knowledgeable peers were observed. During the situational mobile learning, learners were observed to be mindful of the environmental conditions – who was present and if they could be

consulted about a learning problem, depending on the context and what they were engaged with. Subsequently, awareness of context and social presence was a means of coordination and communication in the learning activities.

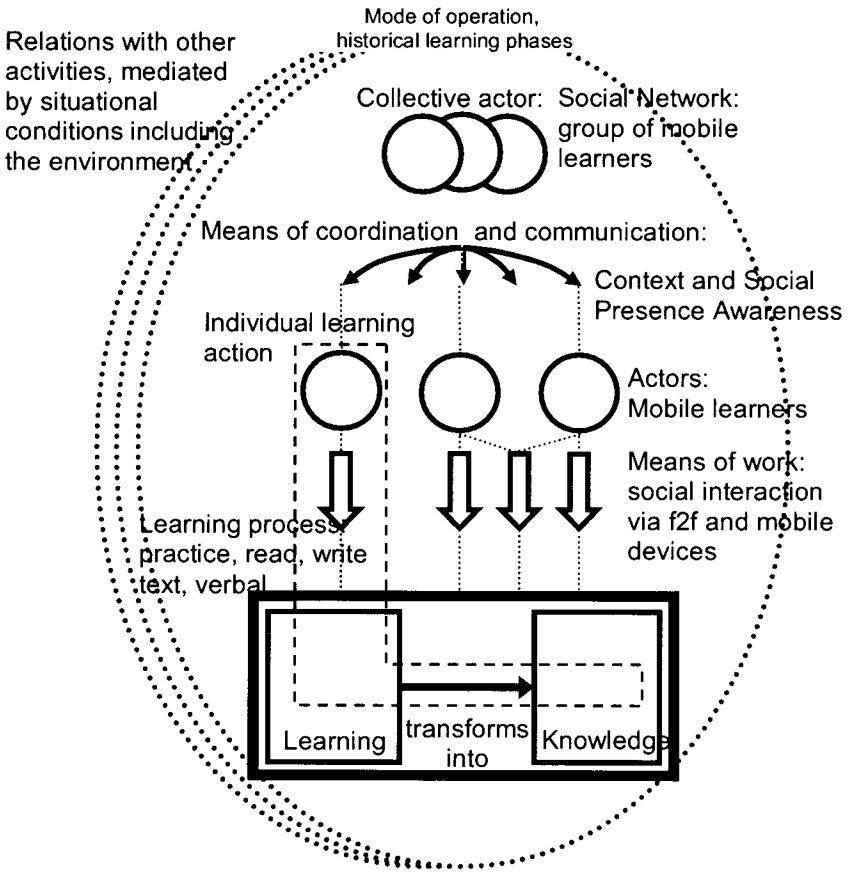

Fig. 27 Framework showing elements of the observed mobile learning activity (Korpela et al, 2004; modified)

Observing and analyzing the mobile learning environments as learners went about their mundane activities in informal spaces of the UCT campus provided me with an understanding, perspective and experience that I could not achieve using other methods of collecting data. Learners were observed to be doing a lot of situational learning where they interacted: asking questions and helping each other on the fly as they came into contact with each other and as opportunity availed itself. Most learning

was accidental in that meetings happening in the observed locations were evidently coincidental and not planned. Where the interactions were not face-to-face, mobile phones were observed to be the most used mobile technology. This phenomenon made sense and was expected since anecdotal evidence suggests that almost every UCT learner owns a mobile phone as opposed to PDAs or laptop PCs. Besides the latter technologies being more expensive, wireless networks at UCT do not cover all the campus locations.

In the following section I analyze the interviews conducted contextually, that is, while learners were engaged in authentic learning activities.

5.5 Analysis of Contextual Interviews

The contextual Interviews were carried out during the week of September 11 to 15, 2006. For some learners, including the participants, this was a mid-term examination week.

5.5.1 Introduction

In the previous sections I have explored and discussed evidence from the questionnaire data, IM learning interaction texts and the mobile learning environments observation in order to understand ubiquitous learning activity and how knowledge transforming action happens in mobile learning environments. This last section analyzes and discusses the verbal interactions I had with participants in five authentic mobile learning locations. The objective of the face-to-face interactions was to have a profound understanding of the role of context and social presence awareness in knowledge transformation from the perspectives and

experiences of the participants, while in varied learning contexts. The contextual interviews were done after the questionnaire data collection – which gave me a general understanding of how mobile learners use social awareness in informal learning environments.

The contextual interviews happened at UCT informal campus locations and UCT residence locations. Firstly, I talked to participants (Pono, Molefi and Mickey), as they were engaged and interacting with the environment, the learning material and during social interaction with peers outside formal classes but within the UCT upper campus. Secondly, I talked to participants (Hazel and Pono) in their residence rooms, where they do private studying, mostly in isolation. The rationale behind the contextual interviews was to understand the knowledge transforming activities in real locations while and where learners actually perform learning tasks. I have already noted that this thesis – hence the case study – is only concerned with learning activities that happen outside the formal learning environments such as scheduled lectures, in order to understand mobility and social awareness and how they relate to activities in informal learning environments.

5.5.2 Upper Campus Informal Interviews (Context Inquiring)

Since the interviews were done by following mobile participants who were not confined to specific locations and times, participants and I had established and agreed on the days and times (when and where they had formal classes) and where I could otherwise locate them on campus.

During the upper campus informal interviews I made mental notes, writing down the full conversations immediately afterwards to avoid losing any key words that might be important (the conversations were very concise allowing me to accurately recall words said). Other than the informal

greeting words before the conversations and the ending words of the conversations like "thank you" etc., including the arrangements of the next research activity where participants were involved, the rest of the conversations are transcribed as they appear below.

I wanted the interviews to be a quick informal conversation based on what had just happened and hence I did not use a recorder or any device that might sway what the learner might have wanted to tell me or shared with me. The questions for the interviews were, therefore, not pre-determined and instead stemmed from what I saw or observed the participants doing at that moment – to make the interaction contextual. The following are conversations I had with Pono, Molefi and Mickey, while they were engaged in a learning activity on campus locations. The three had been identified during the questionnaire data collection and asked to take part in the contextual interviews.

Fig. 28 Mobile learners engaged in learning activities through social interaction at the Leslie Social Science building

5.5.2.1 Contextual Activity Interview with Pono – Leslie Social Science mobile learning environment

The conversation took place at 12:47p.m., September 11th, 2006. I met with Pono at the Leslie Social Science Building (the student centre) right after he had a face-to-face interaction with his two friends, both males. After greeting him, I commenced our conversation by posing the question:

You have just had a group discussion with those guys, why do you consult with your peers and not your lecturers?

> *Because, man, them teachers don't explain things well and I always have to talk to my friends who explains things better for the task I need to finish. Besides, lecturers are never there, they're not always available if when you need them.*

Pono's experience is that his knowledge transforms more positively when the learning actions include social interaction with peers than it does during a formal lecture. His experience implies that mobile learners like him seek social support from knowledgeable peers rather than from instructors because peers tend to be more socially present.

What do you mean by they don't explain things well?

> *You see, they either rush over stuff during a lecture and then give you huge assignments to finish and hand in, and I don't know maybe they need to slow things down or at least explain things required from us.*

His perspective informs me that the context in which lectures are delivered is not always favourable to some learners; hence the need to consult with

peers for on-demand personalized support, instead of consulting with lecturers.

Explain what you mean by slow things down or explain things required from you.

> *You see, it is easier with my friends because when we sit and discuss stuff, we try to break it down until we all understand or half understand ... hahaaha!*

Some learners often need learning objects to be unpacked in a certain way and peers provide the necessary personalized social support where learners can question and understand the learning material better than during formal lectures.

What language were you using when you were discussing with your friends?

> *Aha, that's another thing. I think I am good with English but then we mostly speak our language, man. Those guys are from Jo'burg* (referring to Johannesburg, South Africa's largest city), *so we speak the same language. We mix English with Tswana and Sotho and things make sense that way.*

Oh, so the fact that you use your own languages helps you to understand better?

> *That's right my man! Look* (pointing at an assignment paper in front of him) *I had no clue what I was supposed to do in here, but TK* (the friend) *explained it well in Tswana.*

The learner's situation and context enable them to understand things differently. That is, the fact that he is Tswana enables him to make sense of the learning material better if it is explained in at least both Tswana and English. Thus, among learners and their peers, the language context awareness does play a role in social interaction whose outcome is knowledge transformation.

That's good, so I guess you will be able to complete the assignment on your own then?

> *Sure, but you never know ... anyways if I get stuck then I will buzz them. We all live at Forest Hill* (UCT residence).

In this case, social presence awareness of knowledgeable peers will be important should he need to consult about a learning problem. By saying that they all live at Forest Hill and that he will buzz (call) them, Pono shows awareness of where and how to get hold of peers – which eases a learning activity.

5.5.2.2 Contextual Activity Interview with Molefi – Leslie Commerce Mobile learning environment

(11th September, 2006 at 14:53). On the same day, Monday afternoon, I caught up with Molefi who had just walked out of the Leslie Commerce building, from a Statistics lecture. I called him (by his real name) and when he stopped, I said to him:

I noticed you rushed to ask that guy a question and yet there was a guy walking right beside you from the same lecture room, how come?

> *Oh nothing, it's just that that guy wouldn't have given me a nice response, he is not too nice a person.*

Molefi's response is interesting in that he was aware of the presence of the learner beside him. In this situation, the learning action is to talk to one of the available classmates. All his classmates are present to help since they just got out of the same class with him. However, he uses social awareness to determine who among those present could be willing and able to help positively.

How do you mean?

> *Mmmh, he thinks too much of himself and says stuff that's irritating sometimes*

Oh, I see…

> *…just the other day, a friend of mine, well not really a close friend but the guy is black, he asks him a simple "Sample variance" question. What does he say? Why can't you people ever find out stuff on your own? He left the guy just like that. And if you ask me, that guy is a bit racist. I won't dare talk to him, man.*

From what Molefi tells me is the reason for not talking to the other learner, social presence in addition to context awareness are important in determining how and who learners seek help or knowledge from. Molefi's personal experience about the learner tells him the learner might not provide the support he needs because of his social views and prior relations with other learners. Molefi's statement informs me that the context of the learner's response was interpreted further based on who he was (social background) and who he was talking to.

I see. So did you get a good response to what you were asking for from the other one?

> *As a matter of fact, I did. Well, I know the guy well because we worked together in the SPSS project.*

Personal experience and the context in which they came to know each other allowed Molefi to feel comfortable asking for help.

5.5.2.2 Contextual Activity Interview with Mickey – UCT Main Library Mobile learning environment.

On Tuesday, September 12 at 4:21p.m., I went up to the Opperheimer University Main Library. After looking around and going back and forth the library floors, I finally spotted Mickey studying in isolation in one of the quiet study rooms meant to facilitate group discussions in the Commerce section of the library. I instantly noticed that she had a mobile phone on her study desk, right beside some handouts she was scribbling on with a pencil.

Hellos, I see that you don't want to miss a single call, right? *I asked mockingly.*

> *Hi Ray, actually I am chatting with my classmate, we have this project paper due tomorrow and she is asking about it. I don't understand everything so we are discussing it.*

Where the learning context and needs are the same – in accordance with the Homophily theory – learners often interact since they have a common goal to satisfy. In this case, Mickey and her friend both had to write a paper so their interaction was about understanding the learning requirements for the paper and getting it done. But how do they interact – in other words, what are the learning actions?

Discussing it? You mean like you SMS each other back and forth?

> *Hahahaa, no man, miXit[1], we are chatting over this. See* (lifting the mobile phone to show me how it looks), *it works just like Yahoo IM.*

[1] **miXit – mobile phone chat rooms**

miXit is a chat application for the mobile phone that allows you to communicate with other miXit users on their mobile phones or even on a PC. The beauty of miXit is the simplicity and the cost. Currently during peak time, an SMS on any one of the South African mobile network providers costs around 80c for 160 characters. Using miXit, the exact same message will equate to around 3 to 5c! (Source: http://www.chatrooms.co.za)

I see, and how much does it cost to have that?

> *It's actually almost free, you just have to register on the Internet, just like the Yahoo stuff. It's so cool because I could chat anytime wherever my cell phone has a network.*

To mediate the problem-driven learning action, the two mobile learners used a mobile instant messaging tool called *miXit* – which was installed and applied on their mobile phones – to maintain their social presence and to interact with those in remote locations.

Yep. It is cool. So do you feel like your friends or the classmates are around the corner, present to help out all the time?

> *Indeed. I can get help anytime I need it so long as they have their phones with them*

Through mobile technologies and applications learners are able to maintain and use social presence awareness to seek or provide social support. The real-time interaction availed by the mediating tool also gives context to the learning action and activity. With *miXit*, the process and learning procedure involves writing and interpreting each other's instant messages.

Does chatting with your classmate help her and you understand the paper requirements better?

> *It is very helpful because then we talk about each other's understandings etc. It is easier than doing it alone sometimes. And the thing is we both need to hand it in so it helps to see where your classmates are so you don't end up doing the wrong things.*

In mobile learning environments, learners make use of social presence afforded by mobile technologies to socially interact with others who have the same learning goals but are located in different learning locations. In this case, context awareness is when a learner knows who to consult with based on the identical learning tasks and how to contact them – the appropriate mediating tool depending on the learning situation.

5.5.3 Mobile Learning Interviews at UCT Residence

5.5.3.1 Introduction

The purpose of conducting interviews in the learners' residence rooms was to observe and understand the authentic learning environment in which they transform knowledge by completing learning tasks, mostly in isolation or with invited close peers. Talking to learners in their own residence rooms added another dimension to understanding a ubiquitous mobile learning activity (system) by affording me the opportunity to appreciate the role of context awareness and how social awareness manifest where learners engage in learning activities in their own private learning environments.

The interviews were carried out with Pono and Hazel at Liesbeek Gardens, a residence located at least a kilometer from the UCT Lower Campus. Liesbeek Gardens is a self-catering residence where mobile learners are responsible for their own cooking, bedding, etc. Other than being provided with the university shuttle bus service to and from the UCT campus, learners residing at Liesbeek Gardens alluded to the fact that they feel the same experience as learners residing in privately owned apartments off campus. To me, as the researcher, this similarity perspective means that the learning activity, actions, and operations

experienced at Liesbeek could apply in any off-campus residence location. Hence, I did not need to carry out inquiries or interviews at privately owned apartments.

The interviews – transcribed and discussed below – were recorded using a digital voice recorder. Unlike the on-campus contextual conversations where the questions stemmed from the just happened learning activity context, I had thought of some questions to discuss with the two participants prior to meeting with them. However, since the interviews were open-ended and contextual, I could follow up on a promising avenue based on the participant's response.

Fig. 29 A learner in an informal learning context (residence room), interacts with a remote peer through IM while studying in his room. A mobile phone, resting on a text book, mediates most of UCT mobile learner interactions.

5.5.3.2 Residence Learning Environment Interview with Hazel on September 14, 2006

Just like we had arranged, I knocked on Hazel's door at about 6p.m. While I walked in, Hazel was busy picking up a couple of printouts and books that masked her study table – putting them on the floor and on the top

book shelf, as we sat down around the table. I then placed the digital voice recorder on the table, between us, while asking for her permission to record our conversation, explaining to her that the whole exercise is important yet voluntary. Being sure that we had the same understanding about recording the contextual conversation, I initiated the conversation.

When you leave campus and knowing that you are going to be studying in your room, probably alone, please walk me through what goes on in your mind and the things you become aware of as you get ready for that?

> *Ok, it's exam time right now and I know I have an exam tomorrow afternoon, so what I did today was download and print all the lecture notes I think I will need, from the Internet. With me it's like my course is more practical, so I learn the theory at home if I have to like study for a test, and I do practical in the labs.*

Context awareness in terms of being aware and knowing the academic learning schedule (e.g., lecture versus examination time) is important to learners. If it is test or examination period learners tend to adapt a different learning activity process where the learning motive is to acquire as much knowledge from volumes of learning materials (there is more need for knowledge transformation to happen). During these periods learners, thus, need more awareness of when to study, what material to cover and where to study as well as where to find social support.

How did you know which notes you will need in preparing for tomorrow's exam?

> *I know the exam is about two hours. Exams that long require more studying of materials and I roughly got ideas on the topics likely to come out, so I am going over those right now plus the test we took*

couple of weeks back. If I could finish this stuff, then I should be ready for the exam.

Hazel has a clear awareness of what learning material to study. She chooses her room as the learning location, as she reckons that she would not need to use the computer laboratories for the learning task. She is also aware that the previous test questions might provide support in understanding and resolving the examination context.

How do you choose to study alone and when do you consult with peers?

If I have a test coming up, I have my own time, the first couple of days I will be studying alone, gathering things that I didn't understand and the next days I will be with my peers and we will discuss, if there was something I didn't understand or they don't understand we discuss.

Hazel begins her knowledge transforming process by interacting with the text books and printouts, reflecting on the learning materials in isolation, and identifying the problem areas for which she subsequently turns to knowledgeable peers for social support.

Do you discuss with anyone you know or how do you choose who to consult with? How do you interact with them?

Well, for me I've got classmates that we always discuss things with, as a group or just me and my close friend. We usually call or SMS each other. If we can find a common time then we meet in here or upper campus in a lab, especially if it's a programming, coding assignment.

Learners often need social awareness of others (social network) to complete learning tasks. The presence of others is often achieved through face-to-face and text discussions using mobile technologies. Anecdotal evidence suggests that almost all UCT learners own mobile phones. Hence, it does make sense that mobile learners utilize the mediating tool common and readily available to most of them – they more often use mobile phones to socially interact with peers than wired learning environments, e.g., emails or instant messaging.

Also, from Hazel's experience, face-to-face meetings happen when learners can find a common time to come together. Finding a common time is often difficult since learners have different schedules and do not necessarily reside and study at the same locations. So the time-location factor and context play a role as to when face-to-face social interaction happens. Again, who they choose to consult with depends on the social awareness, e.g., the likelihood of that person being able to help – a classmate or a peer who has taken a similar class.

I see that you have been doing some studying before I came in, would you be doing the same if the weather condition was different, say if it was raining or very cold?

> *Mmmh, if it was really raining, I would probably be in my friend's room rather talking about this stuff than me being alone here. Books and heavy dark rains, no ways!*

I posed this scenario question to try and understand if environmental conditions, like the weather, could influence how learners choose to transform their knowledge. Evidently, from her response, she would rather have a face-to-face social interaction with a peer than interacting in isolation with her books.

Instead of being physically present with them, how about calling your friends or chatting via IM during the rainy night or day, will that make a difference?

> *To be honest, I don't like using any kind of electronics when it's raining, especially holding a mobile phone to my ear, it is not safe. If we had speedy Internet connection in the room I could try chatting online, but not comfortably though.*

In other words, in certain weather situations (environment context) like the rainy times, the face-to-face social interaction with a peer for a learning purpose could be more constructive than the technology-mediated social interaction. Thus, awareness of an environmental condition influences how social interaction whose outcome is knowledge transformation would happen.

5.5.3.3 Residence Learning Environment Interview with Pono on September 14, 2006

On the same Thursday, after the discussion with Hazel, I visited Pono at about 7:28p.m. By this time, the shadows of darkness were gradually creeping in. Unlike Hazel's room (which had furniture and electronic appliances looking like they were arranged by a professional interior designer) Pono's room looked more like a basement game's room. He had posters of various professional ball players including Dennis Rodman (the flamboyant former Chicago Bulls basketball player) and a plastic basketball net stuck to the wall, a play station 2 console and a DVD player hooked to a TV set sitting right beside the end of his bed; a laptop was on the floor next to the TV set, the music system was placed on his study table leaving little space for both of us to share the table. Nevertheless, I was able to find a little space on the table to place the digital voice

recorder, between us, while asking for his permission to record our conversation. I explained to him that the whole exercise was important yet voluntary. After I was sure that we were on the same page, I set off our conversation.

How do you decide where to study? What kind of location do you prefer to do most of your learning tasks?

> *Ummmh, it depends. If I am discussing with my boys then it is mostly at school because once they come here then we do nothing but play games. Most of the comp sci* (Computer Science) *projects I do in the school lab but some here too. Otherwise, I prefer studying in my room. My room is peaceful and I know where everything is, so I can still do other stuff like playing music, watching TV and even cooking...hahahaaa!!*

The above experience shows an awareness of a situation where learning tasks would not be done with peers because of other distractions, such as video games, should they choose his room as a learning location. On the other hand, he prefers to learn in his room because it allows him to concurrently engage in other activities.

So learning in your room allows multi-tasking? Tell me how it is good to multi-task?

> *Time, time my friend, time!! Do you see how much work they give us? If you concentrate only on UCT* (University of Cape Town) *work, then you might as well forget about having a life. I try to have a social life and school life, all in here at the same time.*

Again, Pono is showing context awareness in terms of the academic work load and the time available to complete it. Having this awareness, he reckons multi-tasking is essential if he was to balance his academic and social lives.

So you feel you are given too much work. Is that why you try to share the load by discussing with your peers?

> *I am telling you, at UCT you cannot cope alone. Hahahaa, even the smartest kid in the class keep asking for help, so it is not easy to do it alone.*

The point he makes is that social support from peers is inevitable in order to complete learning tasks. Thus, a learner's social network (identifying and locating knowledgeable peers) ought to *move* with him or her in order to keep a consistent personalized academic support. For the social network to *move* with the learner means learners need a consistent awareness of a social presence as well as context awareness.

So when you need help, how do you find and contact your knowledgeable friends, say from here (his room)?

> *I have numbers* (mobile phone contacts) *for the people I often study with, you know, those that we sit down and discuss stuff before and after the work is done. I can call or SMS one right now and see if he can come over here.*

I see, so you either call them or SMS them using your mobile phone. How about instant messaging (IM), have you tried that?

> *Man, instant messaging is good, real good. I have a Yahoo IM account, but the thing is we have no fast Internet connection in our rooms, so, that we can't use. But I always logon whenever I am in the labs and if friends are there, then we chat.*

Being aware that they do not have access to a reliable and fast Internet connection or IM access in their residences, learners tend to use technologies most common to them to maintain their social presence

which then enables a learning activity. In this case, almost every learner is reachable through a mobile phone, hence its popularity for social interaction with remote peers. Unlike IM, however, mobile phones do not have social presence indicators hence a learner has no awareness of availability of peers until a call goes through or until an SMS is responded to. Nevertheless, a mobile phone is still an enabler of a learning activity.

During what kind of weather situations would you rather not study?

> *Ummmh, if really hot then I would rather be at the beach or hanging out with the fellows, when it's cold that's when I close myself in here and do most work. I don't like being out in the cold.*

How about rain, heavy rains?

> *Oh no, not when it's raining. Especially when there is lightning, hell no, no ways!*

How come?

> *Ok, ever since ...when I was doing matric* (high school leaving certificate) *some guy in my class was almost killed by lightning while studying. He woke up in the hospital but he couldn't speak for two days. So no books whatsoever during lightning, man!*

Pono's experience brings out two important observations: firstly, awareness of a weather situation does influence a learner's actions or activities. Secondly, having awareness of the consequences of doing certain activities – based on personal experience such as the near death experience of a fellow learner when he was studying during lightning – do influence a learner's actions or non-actions.

5.5.3.3 Conclusion on the Contextual Interview Data Analysis

The purpose of doing contextual interviews in two different learning environments – main campus locations and university residences – was to observe and understand another dimension of a mobile learning activity in knowledge transforming actions in informal learning contexts and in semi-formal learning contexts. The objective was to explore how social awareness manifest in two authentic mobile learning environments from the learners' perspective.

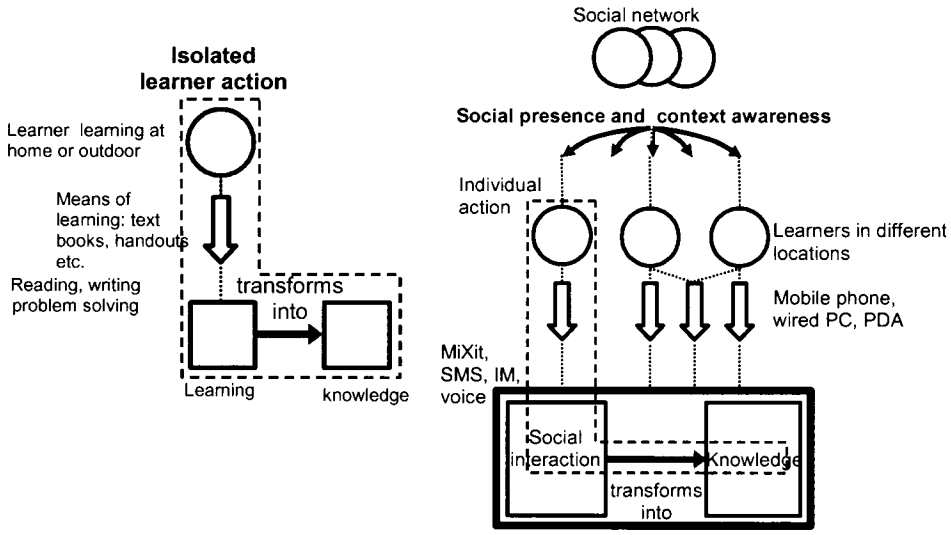

Fig. 30 An isolated learning activity versus a social interaction learning activity

Figure 30 shows learning activities in mobile learning environments. In isolated learning, the process of learning involves a learner interacting with text books and other learning material while in social interaction learning the process of knowledge transformation involves text-based interaction such as miXit, SMS, IM and voice to consult with peers who are not in the same location.

Evidently, a learner moving from campus locations to residence locations uses social awareness to engage in learning actions that would enable a learning process or activity to effectively take place at home. A learner completes learning tasks at campus informal locations and not at residence mostly for two reasons: firstly, it is easier to find common times with peers (especially after or before attending the same class) and secondly, because a learner has access to other resources such as a computer laboratory installed with specific programs which are not accessible elsewhere. In other words, there is more face-to-face social presence of knowledgeable peers and other resources at campus locations than at off-campus locations.

The face-to-face social presence of peers and other resources decrease as learners move away from campus locations – where most social interaction is then mediated by mobile technologies. For that reason, learners need more awareness of context and social presence of social resources as they move away from campus locations to residences. Other than for these two reasons, the same learning activities and actions are performed in both campus and residence learning contexts.

5.6 Conclusion on Data Analyzed from the four sources

The study was undertaken to address the research question "How does social awareness influence a learning activity?" The data collection and subsequent analyses was to reach an understanding of how context and social presence awareness manifest in a mobile learning environment, where knowledge transformation is the outcome of learners' social interaction. The first step towards reaching an understanding was carried out in this chapter with the analyses of the data collected from the four different sources used in the case study. The results of the analyses are recapitulated as findings in two salient points that could further facilitate

the understanding. These were: viewing the mobile learning environment as a complete activity system and the importance of social awareness in the mobile learning environment activity system.

5.6.1 Brief Overview of Findings from Data Analysis

The preceding analyses have shown that social awareness of the social resources, the learning task, and the environment does influence the action a learner undertakes. Through Activity theory lens, which was applied differently to the different data, the analyses have also shown how social awareness and the action happen in varied mobile learning environments.

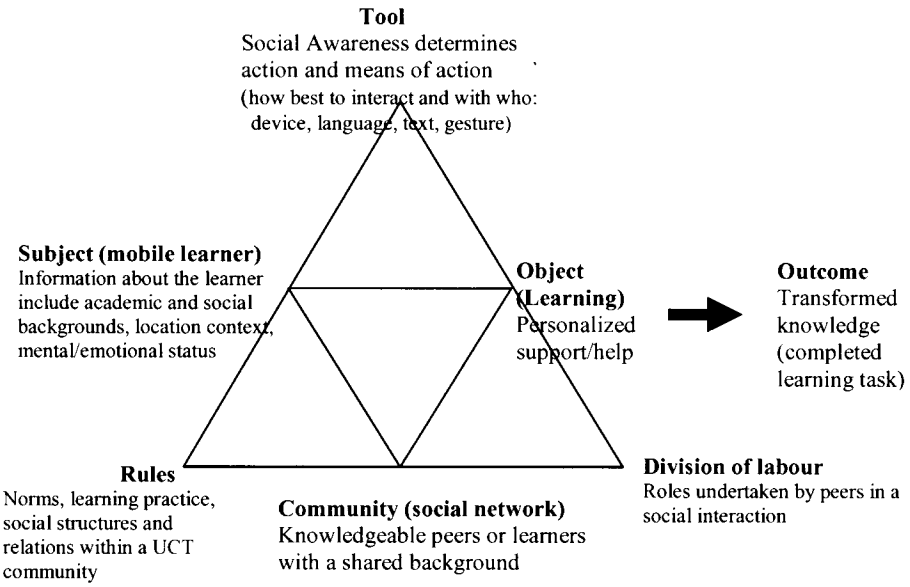

Fig. 31 Summary of findings using the basic Activity theory diagram

In figure 31, awareness of context and social presence determines the appropriateness of a mediating tool. From the analyzed data, these mediating tools include varied languages, IM text, wired and wireless

devices. The mediating tools are used differently depending on the learner's context and needs. Another aspect of social awareness includes the location factor and context, which manifests as valuable to how the interaction is influenced. Culture and social background manifest as playing a fundamental role in mobile learning contexts where learners often would rather seek help or support from peers who share a background. A common background allows better understanding and better communication and thus eases up knowledge transforming interactions. Awareness of context also manifests in how an interaction is influenced by a learner's emotional and physical state, including behaviours and actions of others. Environmental situations also manifest as playing a role in a learner's activity decisions. Social presence of peers manifest as fundamental with the role it plays in the knowledge transforming activity decisions. Awareness of a social presence enables an opportunistic learning interaction and can also motivate a learner to engage with a learning task.

The above was a synopsis of the study findings. These findings are unpacked and discussed further in the next chapter. Following the discussion, the research findings are interpreted.

Chapter 6: Discussion and Interpretation of Findings

6.1 Introduction

> "If the persons training a child primarily set themselves the goal of imparting knowledge of some sort or other and pay little attention to how the child itself goes about it, by what operations it solves the school problem it has been set, and does not check whether a further transformation is taking place at the proper time in these operations, their development can be disturbed" (Leont'ev, 1981: p432).

This research was about discovering "how the child itself goes about it", revealing the actual nature of knowledge transformation through social interaction where social awareness is argued to be the underlying process. This chapter presents a discussion and interpretation of the findings of the study which resulted from the application of the empirical research procedures discussed in chapters four and five.

As discussed previously, the study was undertaken to reach an understanding of how context and social presence awareness manifest in a mobile learning environment, where knowledge transformation is the outcome of learners' social interaction. A first step towards reaching an understanding was undertaken in chapter five with the analyses of the data collected from the four different sources used in the case study. The results of the analyses were encapsulated as "findings" in two salient points that could further facilitate the understanding. These were: viewing the mobile learning environment as a complete activity system and the importance of context in the mobile learning environment activity system.

Using Activity Theory, these two aspects are further discussed in this chapter. Following the discussion, the research findings are interpreted. In order to proceed, the next subsection first briefly reviews the context of the study.

6.1.1 Overview of the Study Context

The central theme of the thesis is that learners are mobile and therefore the case study looked at the learning environments and the mediating elements that, taken as a whole, support the mobility of a learner as s/he traverses the varied learning contexts. In that regard, the same learners Pono, Hazel, Molefi, Mickey and Neo (pseudo names) participated in all four units of the case study. Using the same participants showed how learners traverse all three learning contexts (formal, semi-formal and informal) as described in the problem formulation section of the first chapter. Each participant was not confined to particular learning places and therefore it was essential to capture the experiences of the same learners in the semi-formal and the informal learning contexts – minus the formal contexts where learning is mostly in fixed locations at allocated times.

Rather than studying knowledge transformation, which happens in the mind of a learner, the research and the subsequent analysis of evidence focused on social awareness and the activities of learners as they interacted with others and the environment. The inquiry looked at situations and experiences in which knowledge needs occur and where learners use context and social presence awareness to justify a learning decision or action, resulting in the (possible) transformation of knowledge. The research was carried out in its local context, with the intension of understanding how a learner in a typical contact university in South Africa

uses social awareness to provide or be provided with personalized social support, in varied learning contexts.

Having previously studied at overseas universities, I am aware of the unique and significant challenges a South African learner experiences compared to his or her counterpart elsewhere. Without elaborating in detail, I will succinctly articulate some of the challenges a typical South African institution faces.

Firstly, South Africa has had a long history of segregation and prejudice based on race and social background. With new educational transformations since the 1994 democratic elections, there are still a significant number of under-prepared learners entering universities due to varying social and cultural backgrounds. The result of this study shows that this challenge could be alleviated when social awareness is used by peers with a shared background to provide on-demand personalized academic support.

Secondly, realizing the diverse cultures, South Africa has acknowledged eleven languages as official, yet only one (English) is in most cases used as the medium of instruction. Chan (1995) argued that the prevalence of one language builds social cohesion and trust, allows people to do their jobs better, and makes the environment safer. However, this study has shown that in a South African higher institution, the one language policy, while building social cohesion, leaves learners who are not fluent in the English language to seek academic social support from peers who have a superior command of the language and share a social background.

6.2 Mobile Learning Environment Activity Elements

In a mobile learning environment (MLE), learners acquire knowledge and experience through social interaction, drawing upon available social resources for the solution of practical learning problems. In discussing the empirical findings, I view a MLE, figure 32, as a learning activity where learners with goals and intensions engage in learning activities and their actions are driven by social awareness – looked at within the context in which it happens.

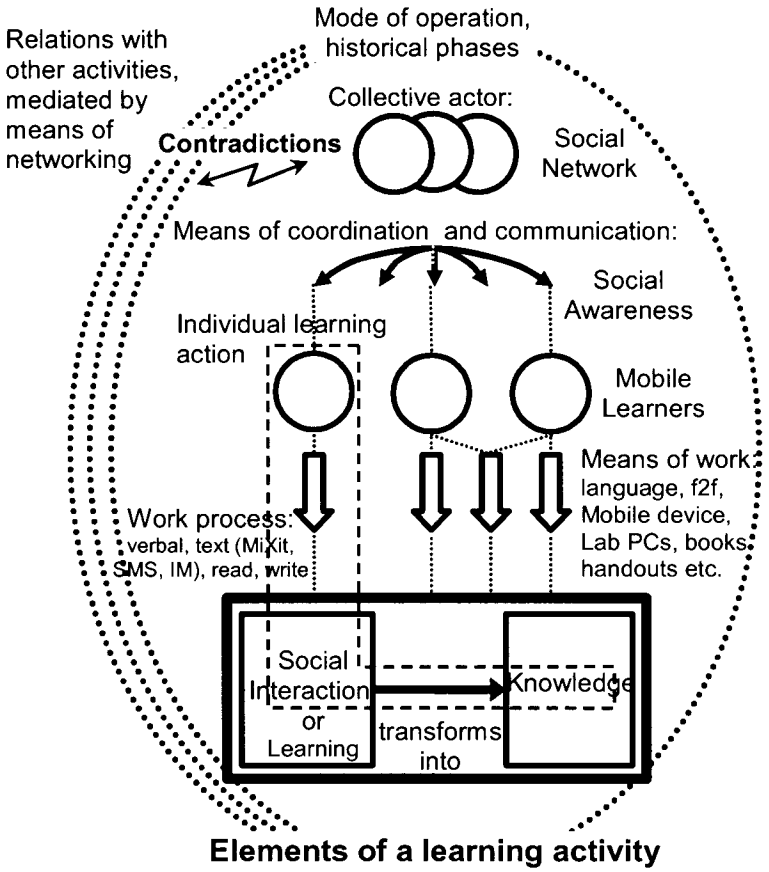

Fig 32. Elements of mobile learning activity model as a systemic entity. (Analytical Framework adapted from Korpela et al., 2002; 2004)

In order to understand the MLE as a learning activity there is a need to shed light on the motives and goals of learners as well as their expectations about the outcome. In doing so, the goal is to understand the context in which a learning activity happens, the motivation for the activity and the subsequent contradictions. With the understanding of the learners' motivations and situated actions, the MLE – as an activity system viewed from the learner's perspective – will be seen to enhance learning and knowledge transformation by way of personalized academic social support (social interaction).

6.2.1 Elements of the MLE Learning Activity Model

In this section, I discuss the elements of the MLE learning activity model, guided by Jonassen and Rohrer-Murphy's framework (1999). The elements include the environment, the learner, the social networks (peers or other mobile learners) and the objective (object). The learner, as the driver of the activity system, performs learning tasks and actions with knowledge transformation as the expected outcome of the activity.

In the MLE learning activity, the learner has a network of peers with which s/he socially interacts about a learning problem. The relevance of the social network is that its social presence impact on the learner's work by providing personalized social support with the intention that the learner accomplishes the goal of the activity. Therefore, to provide relevant social support, it is important that the social network also sees the learner's goal and motivation as significant. Thus, the nature of the social interaction is influenced by awareness of context and social presence. The social awareness is steered by prior knowledge, experience, beliefs and instincts.

In the mobile learning environment, knowledge is the outcome of social interaction (when learners interact they are also learning, thus, social interaction is synonymous with learning). Since knowledge is gained while learning and is itself transformed in the process, it is also the object – that is, the thing to be acted upon. In that regard, knowledge as an object is acted upon by a learner and is itself transformed, so that the object is and could also be an outcome.

In the activity system, context awareness becomes rules which learners use to make decisions on how they act on the object, which object to act on, and whose social presence is needed (with whom they interact). The quality of the outcome – knowledge transformation – is evaluated in formal environments through assignments, tests and examinations. Ultimately, successful completion of the objective – quality knowledge transformation – should move the learner toward fulfilling the intentions and the reasons for engaging with learning activities at the University of Cape Town.

6.2.2 The MLE Activity Structure

The mobile learning environment activity structure refers to all the activities that engage the learner. The activity structure defines the purpose of the activity system. In the MLE, activity structure describes the inter-relationships of the social awareness and the actions focused on learning as the object. As previously noted, knowledge may also be the object that is acted upon. The activities include social interactions, learning, as well as the mundane and habitual everyday behaviours. In other words, the activity structure includes activity, action, and operations.

At the activity level, the focus is on the intention or motives – awareness of needs and requirements. The same activity may be accomplished by different learner actions depending on the context, and the social

presence at times. The action level uses problem solving actions to fulfill the activity. Learners' actions include studying and completing a learning task either in isolation or interacting with peers. The actions, in this case, studying or engaging on a learning task with peers, are driven by awareness of need or requirements and social presence. The same learning action can fulfill varied learning activities, thus, may also change the object and the outcome. Operations are habitual behaviours of learners. In the beginning, operations are conscious learner actions with both orientation and acting phases. After a while, the orientation phase is eliminated, and action is reduced to an operation. For example (see section 5.3.4 on mobile learning activity three), an Information Systems learner needed a peer's social support to learn the steps of building a successful database. After learning the steps, building a database becomes less of a problem but an operation.

The mobile learning environment has activity structure that consists of activity, action and operation. For any learner's intentions and motives, it is necessary to identify all of the actions and operations that support the learning activity. The learning activity is what defines the mobile learning environment since the learning environment focuses on an activity. It is, thus, also necessary to understand the intentionality of the action for the mobile learner, where there has to be an understanding of why and how they engage in a situated learning action.

Table 12. A mobile learning activity system structure

Activity	Action/task	Operation
Isolated learning	Reading, writing, term project, e.g., building a database	Learning from Handouts, books Website, PCs
Learning via social interaction	Face-to-face meeting, phone call, text message	SMS or MiXit on a mobile phone, instant message on PDA or PC

Table 12 shows a simple mobile learning activity structure where a learning activity is oriented to motives that satisfy a need. An action is the learning process functionally subordinated to activity and directed at specific awareness goals. In mobile learning what motivates a learning activity and the goals to which the activity is immediately directed is of fundamental significance in that, for example, it changes the context for the learning activity and how it is carried out. Actions are realized through operations that are themselves determined by the actual awareness of context and social presence, that is, actual conditions of activity.

6.2.3 The MLE Tools and Mediators

The finding from the study shows that the elements of the mobile learning environment – the learner, the social network and the object – do not always interact or act on each other directly. In fact, their interactions are often mediated by signs, conditions and tools. Tools and mediators basically describe the kinds of approaches that constrain, enable or shape a mobile learning activity. In the mobile learning environment observed, the mediators consisted of varied languages (spoken and written), text including messages, handouts and books, as well as mobile devices that included mobile phones, laptop PCs and PDAs.

In the inquiry, the tools – language and mobile devices – mediated a learning activity by enabling social interaction between mobile learners. UCT learners have diverse social and language backgrounds. Evidence analyzed in chapter five shows that whereas the English language served as a collective mediator for most learning activities and actions, for some mobile learners it hindered social interaction – prompting these learners to resort to seeking social support mostly from peers who can speak their

mother tongue. For example, (see section 5.5.2.1 Contextual Activity Interview), a participant remarked:

> *Those guys are from Jo'burg, so we speak the same language. We mix English with Tswana and Sotho and things make sense that way... I had no clue what I was supposed to do in here, but TK* (the friend) *explained it well in Tswana*

In the study, the widespread mediating tool in the mobile learning environment was a mobile phone. The mobile phones unlike PDAs and laptop PCs are readily available to almost all learners. Thus, mobile phones mediated most of the textual and verbal interactions with others not in the same location. Although PDAs are not as common as mobile phones, they were made available to participants to mediate opportunistic and spontaneous textual social interaction facilitated by the instant messenger social presence indicator.

6.3 Discussion of Context in the MLE Learning Activity

In the mobile learning environment activity system, interaction between learners and between learners and activity was influenced by social presence and the context in which learners found themselves – that is, how and why the learning actions happened. The research has shown (e.g., see section 5.3; BEE and database IM interactions) that knowledge transformation is the outcome of social interaction where social interaction is a consequence of social awareness and social awareness is synonymous with awareness of context and social presence. To this point, I discuss how mobile learners used awareness of context and social presence – that is, how social awareness manifests – in the following sections.

6.3.1 The Role of Social Presence in the MLE Learning Activity

In this inquiry, where personalized social support through social awareness exists in extended time and in informal learning spaces, social presence awareness is understood to be significant in three ways: (1) Given that knowledge transforming experiences are ubiquitous, learners need social awareness of available social resources[2] they can instantly draw upon for consultation should a learning problem needing immediate attention arise; (2) The mere social presence awareness of other learners engaged in a learning activity may provide enough motivation for a learner to engage in a knowledge transforming activity and (3) Awareness of social resources may instigate an opportunistic and sometimes an on-demand situated learning.

(1) Drawing from the analysis of the empirical evidence, the need for social awareness of available social resources arises because the social presence of instructors is inadequate and learners do not necessarily get satisfactory clarifications or solid explanations of learning tasks in formal learning contexts. The experience of some learners is that there is inadequate or lack of instructor social presence, notably as they move away from formal locations. A participant noted that:

> *... teachers don't explain things well and I always have to talk to my friends who explain things better for the task I need to finish. Besides, lecturers are never there, they're not always available if when you need them* (see section 5.5.2.1).

The social presence of peers, notably with a shared background, becomes increasingly essential where culture and language may inhibit a positive learning experience and outcome. Some of the participants alluded to the

[2] In the thesis the term *social resource* refers to a knowledgeable peer who could provide personalized academic social support.

fact that they hardly understand what the instructor is asking of them so that they often rely on the social presence of their peers who share a similar language to help them understand. In this regard, knowledge transformation in terms of understanding a specific learning task happens owing to the social presence of peers with a shared culture and language other than English. Participants also alluded to the fact that being aware of knowledgeable peers' social presence puts them at ease since they know they can get help should they need it (see section 5.2. table10). I could infer that being at ease because a learner is consciously aware of a social presence facilitates the knowledge transformation.

(2) The social presence awareness of other learners engaged in a learning activity may provide enough motivation and incite a learner to also engage in a knowledge transforming activity. For example, while observing participants and other mobile learners, I noticed that it was not uncommon to see a passerby learner abruptly stop and engage in a learning activity (opening his or her books to read or ask questions) as soon as they saw or encountered others learning. Participants said that they get motivated and feel like sitting down immediately to do their own work as soon as they see others working. Scenarios like this are not uncommon. When a learner goes into the library with the whole intention of dropping a due book and s/he decides to sit down to study a bit after scouting the place, then clearly s/he was motivated and incited by others' social presence. A participant commented that:

> *"if I see a lot of other students studying and discussing with their friends, they keep me motivated and I ask them questions."* (Table 9, Section 5.2.2)

In this regard, the mere social presence awareness of others does help learners to engage in a knowledge transforming activity. Another example

is in the observation of Hazel at the shuttle bus stop (see section 5.4.4.1) where a friend of Hazel stopped and engaged in a short knowledge transforming discussion with Hazel. This opportunistic learning action, although very brief, was motivated by awareness of Hazel's social presence.

(3) Awareness of a social resource presence instigates an opportunistic and spontaneous social interaction. In a learning situation where learners are faced with a problem, awareness of a social resource presence facilitates a learning activity. Often, learners were observed to instantly draw from a knowledgeable peer whenever their paths crossed. For example, (see Section 5.4.4.2), where Molefi consulted with a friend who was just passing by. The spontaneous interactions are often in the form of a confirmation such as *"Hello Hazel, are we still writing that test tomorrow?"* or an intervention such as *"Hey, how do you answer this question?"* Awareness of a social presence could mean a difference between receiving an instant resolution of the problem and struggling unsuccessfully with a learning problem. Where learners are learning in isolation mobile technologies like mobile instant messaging (IM) do provide awareness of social presence in remote locations.

6.3.2 The Role of Context Awareness in the MLE Learning Activity

The main characteristic of a mobile learning environment activity system is that the learner has increased freedom of mobility. The increase in mobility creates situations where the learner's context such as location, presence or non-presence of others as well as things around him or her, are dynamically changing. Thus, in the mobile learning activity system, context awareness proves to be a useful and fundamental concept to understanding how the activity structure shapes. In the inquiry, context

awareness allowed mobile learners to adapt their behaviour and actions to the circumstances in which they found themselves.

Drawing from the analysis of the empirical evidence, the following sections give a discussion of the role of context awareness, how it was experienced and why it is significant to ubiquitous social interaction whose outcome is knowledge transformation. The context awareness in the MLE activity system is categorized into: 1) Mediating tools as context of the activity, 2) location of a learner as context of the activity, 3) proximity, 4) learner's situation – social context, activity context, and environmental context.

6.3.2.1 Mediating tools as context of the learning activity

The mobile learner's objective is to positively transform his or her knowledge so that they are better prepared to accomplish their goals and fulfill the university requirements. The objective is to transform knowledge by solving a time-driven learning task in isolation or through face-to-face social interaction with others in the same location or with those in remote locations. To seek help or interact with those in remote locations, learners use wired or wireless mobile technology to mediate their actions.

Evidently, learners use context awareness to decide on the appropriateness of the mediating tool. For example, if a learner is faced with a time-driven learning task s/he cannot resolve in isolation then s/he uses a PDA or a mobile phone to call or text message a peer as opposed to writing and sending an email to a peer. In this situation the learner is aware of the need to get instantaneous response, aware of how best to get the instant support, aware of how best to get social presence, as well as aware of the best mediating tool to exploit. In some instances, the subject matter (learning content) appropriates a tool, e.g., a questionnaire

case unit participant noted that she used email because it allowed her to phrase the issues better and by the same token the peer could review and respond with specific and thorough answers (Table 4, Section 5.2.2). Incidentally, her awareness of the tool and the subject matter is essential in determining what communication technology will best mediate the sharing of learning experiences, hence knowledge transformation.

The University of Cape Town (UCT) participants and other mobile learners were observed to mostly use mobile phones to interact with others in remote locations. The context awareness prevailing is that almost every UCT learner owns a mobile phone that can, in addition to providing verbal interaction, at least send text messages (SMS). The popularity of interacting this way was also driven by social presence awareness. In other words, the learner's experience and awareness was that their peers always took their mobile phones with them everywhere (Table 4, Section 5.2.2), and hence would always be present or available should they need to consult them. It helps a learner if they are aware that a peer has the same mediating tool.

Again, in South Africa, mobile phones encourage learner mobility in a manner that other wireless technologies such as pocket PCs (PDAs) and laptop PCs cannot. Mobile phone networks cover every location on and off campus whereas wireless LAN is restricted to certain campus locations. Wired networks (computer laboratories) also limit learner mobility in that they too are accessible only in certain campus locations, inevitably forcing learners to come to those locations, should they choose to interact this way.

6.3.2.2 Location of a learner as Context of the Activity

"Hello, where are you at?"

The above quote is a common initial phrase that paves the way for most learners' mediated interaction. In its simplicity, the sender or caller wants to be aware of the receiver's location to help determine if the interaction could possibly continue, discontinue or be reshaped.

Since knowledge transformation and learning tasks are not time and location fixed, learners' experience is that they need to interact with peers from anywhere and at anytime. To this point, learners need awareness of where they are themselves and where their peers are located, which is significant in determining the plausibility of a social interaction. Awareness of where the learner is and the peer's location are significant in determining two things: 1) if the location is favourable for a learning activity or social interaction, and 2) proximity. The two general reasons are unpacked below.

(1) Learners need to determine if the location context is favourable for a text or a verbal interaction. For example, participants said they would not bother calling a peer should they be aware that s/he was attending a lecture or was in the quiet university library but, nevertheless, they would send a text message if they still feel a need to consult (Table 5, Section 5.2.2). The awareness exhibited in their experience is that the peer could not be able to talk back during a lecture or in a library location but could possibly still text them back.

Location awareness is significant in that learners know where or where not to disrupt a peer. Another participant noted that it would not make sense for him to bother his peers with school work if he knew they were in a club or bar, for example. In this regard, the participant is also aware of the peers' location where they would likely not provide positive support based

on their situation or mind readiness – they probably went to the club to get away from learning activities. On the other hand, learners felt at ease contacting a peer who was at home since they would most likely be flexible and relaxed to positively respond to their consultation (Table 5, Section 5.2.2).

Where learning is done in isolation, mobile learners have varied preferences for selecting a learning location. All in all, their awareness in choosing locations have a lot to do with what activities and how much learning they can do while in that particular location. For example, a participant said that he preferred studying in his room since it was peaceful and he knew where everything was, so that he could multitask (see Section 5.5.3.3). In other words, the preference for his "peaceful" room as a learning location is because he can control all the actions and what happens in his room as opposed to, say, if he was in a computer laboratory or library where learners concurrently perform varied learning activities and actions.

Where learning is done during face-to-face social interaction, learners choose a location – such as the Jammie stairs – that allow them to freely engage in verbal exchanges of learning experiences. Accordingly, learners are aware not to use, as a notable example, the library for verbal discussions. At UCT, learners' awareness of a good location for face-to-face social interaction often led them to outdoor informal settings such as the Jammie stairs or the Cissie Gool plaza (described in the observation section of the preceding data analysis chapter). At these informal learning locations, mobile learners use social awareness to express themselves at dynamic voice levels even as they are sharing the location with others not known to them.

(2) In a mediated social interaction, learners' initial question of *where are you at* is also to establish if a peer's location is closer or farther from where they are or where learning activity could best take place, that is, to establish proximity. In this inquiry, awareness of proximity facilitates the chances for face-to-face social interactions as well as chances for sharing location based knowledge artefacts (Table 5, Section 5.2.2). One participant said that she asked the question, *where are you,* to find out if it was a location where she could quickly meet with that person as opposed to interacting using the more expensive phone calls or SMS.

Learners also use location awareness to determine if they could take advantage of the peer's location. For example, if a peer is closer to the library they may be asked to find a book or check out information exclusively available in the library (e.g., Hazel and Pono's IM interaction in section 5.3.3). If they are in a computer laboratory, a peer could be asked to download a lecture handout or check out information only accessible online.

6.3.2.3 Learner's Situation as Context of Activity

In the following sections I discuss the role of a learner's situation and how it impacts social interaction. A learner's situation refers to context awareness dealing with culture and language, the learner's current activity as well as environmental states. I refer to the learner's situation dealing with culture and language as social context and that dealing with the learner's current activity and environment as activity context and environmental context, respectively.

6.3.2.3.1 The Learner's Social Context

I have already talked briefly about the language policy as applied in South Africa and at the University of Cape Town. South Africa has eleven official languages but only one, English, is the medium of instruction at UCT. I have also alluded to the fact that some learners with non-English learning backgrounds have difficulty understanding the lecturer or the learning material. To these learners, social context awareness means finding and interacting with social resources who share the same language and culture, where culture is synonymous with social background.

When interacting with a peer who does not share the same language, mobile learners exhibit social context awareness by shifting to the language nearly common to all of them. During the inquiry, I observed that race was often used as awareness of social context. As an example, most African learners seldom used English when meeting and greeting other African learners, regardless of nationality, unless they had established that the learner is not South African. On the other hand, they always greeted and interacted with any non-African learner in English. By the same token, non-African mobile learners were observed to greet other non-African learners either in Afrikaans or most commonly, in English. They almost always greeted and interacted with an African learner in English. Therefore, in a mobile learning environment, social context awareness plays a significant role in deciding and shaping a social interaction whose outcome is knowledge transformation, especially for mobile learners with diverse social backgrounds.

6.3.2.3.2 Learner's Activity Context

Activity context describes the actions for performing a learning activity. A learner's awareness of the demands of a learning task determines if s/he should seek support from peers or undertake a task in isolation (section

5.5.3.2). If a learner does not understand a learning requisite then they are likely to seek support from knowledgeable peers, in most cases, classmates.

When learners seek support from peers (social network), activity context awareness helps them to decide whom to consult and how. Having awareness of what learning tasks and activities others are involved in eases the consultation. For example, at UCT, November is a month in which most undergraduates take their final year-end examinations. During this hectic period of the year, learners are aware that others are most likely engaged in preparing for the same examinations as they. When learning tasks and activities are the same, learners interact more since they have a common goal to satisfy. Subsequently, activity context awareness enables learners to interact closely with others involved in similar learning tasks.

6.3.2.3.3 Learner's environmental context

Environmental context describes weather situations, e.g., rain, interior and exterior temperature and the surrounding atmosphere (noise levels, the crowd and movements). Awareness of environmental context was observed to influence what and how a learning activity happened. Some mobile learners were observed to be sensitive to the weather situation and the surrounding atmosphere in determining how they performed a learning task. For example, when it is raining, learners like Hazel (section 5.5.3.2) would rather have a face-to-face social interaction with a peer as opposed to performing a learning activity in isolation. Some learners preferred to study in a quiet learning environment while others preferred to perform learning tasks in environments with some level of noise.

6.4 Conclusion on the roles of social presence and context awareness in the MLE Learning Activity

The preceding sections, drawing from the analysis of the empirical evidence, discussed the roles of social presence and context awareness and how social awareness manifests in a mobile learning environment. The findings reveal that social interaction is a consequence of awareness of context and social presence – where mobile learners engage with different matters of consciousness, activity, action and operations as the learning environment dynamically change. The evidence shows that awareness of context and social presence is a useful and significant characteristic for sharing learning experiences and the consequent transformation of knowledge that occur independent of location and time.

When learners socially interact face-to-face or through mediation, they are able to use inherent situational information, or context awareness, to increase or decrease the knowledge sharing experience. Thus, in a mobile learning environment, the learners' use of context and social presence awareness is important since it impacts the knowledge transforming decisions and actions, as the learning contexts change.

In the next section, I interpret the research findings that have been discussed in the preceding sections.

6.5 Interpretation of the Research Findings

The knowledge transforming tasks, actions and activities of mobile learners are necessitated by the need to fulfil a certain university requirement, thus the transformation is contextual. This means that context changes what is known or how it is known; so that learners learn and know differently depending on the context. For example, the context of the requirement determines the kind of knowledge, tacit or explicit, to be transformed – what knowledge the mobile learner should act upon as well as how a learner should go about the activity. Having said that, it is very important to realize that the individual learner's transforming actions can only be understood through the collective activity which they are part of.

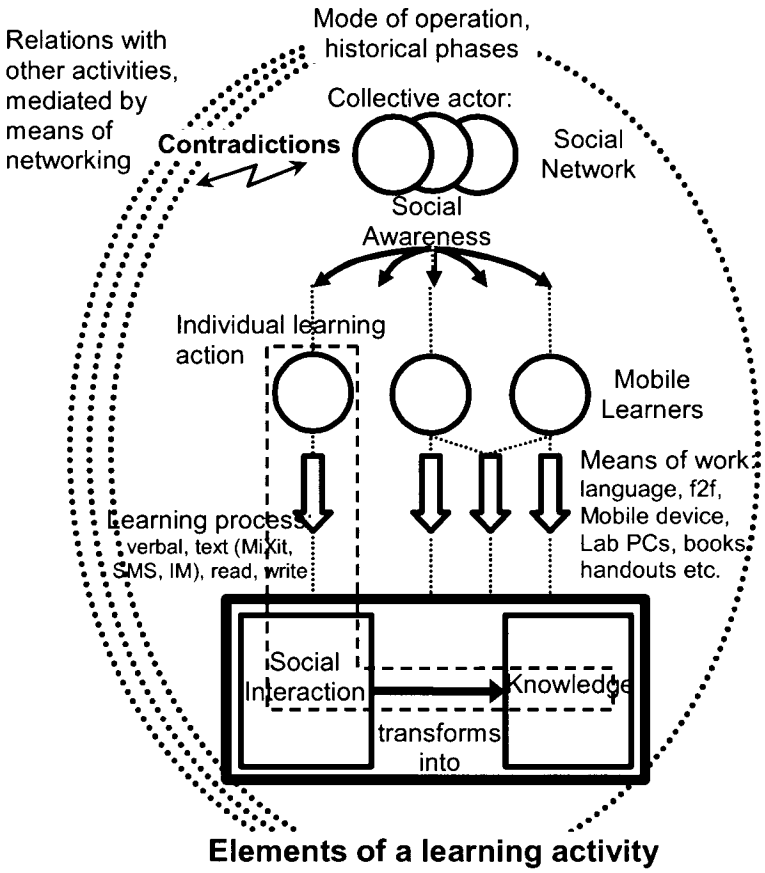

Fig. 33 Mobile learning activity as a knowledge transforming system
(*For ease of reference, Figure 33 is a repeat of Figure 32*)

The motive of a collective activity is in its shared object (Leontiev, 1978) and, in this case specifically, in what knowledge transforms into during the activity. Instead of several bunches of uncoordinated learning actions, knowledge transformation consists of systemic activities (see Figure 33) subordinating the actions in a purposeful way.

The means of the individual actions or mediating tools including social infrastructures are needed within an activity (Engeström, 1987). Mobile learning activity systems evolve through long historical cycles in which obvious beginnings and ends are difficult to determine. But a learner's action has a clear point of beginning and end, and is relatively short-lived. In this study the actions are regulated by social awareness – context and social presence awareness. In other words, a mobile learning environment is defined by the group of activities and actions that are coordinated and controlled by social awareness – where social awareness is the primary source for the rules applied within and between the other activities (Kekwaletswe, 2007) of the UCT institution. The sense of a learner's action lies not in the action itself but in his or her relation to other mobile learners, learning situation and the environment. The emergence of action as a coordinated part of a learning activity performed by a learner is accompanied by a shared meaning of the action that is reflected consciously by the mobile learner.

In a mobile learning activity, the knowledge transforming actions include questioning or reflecting on a learning material. The subsequent action involves awareness whereby reflection on a learning material and a learning situation determine if the learner may need to consult with peers and how. In this regard, the goal and plan of the action are regarded as a single problem-driven act. A plan is an indication of an intention to resolve a learning task, and an intention to engage in a learning task presupposes a goal to be achieved. This then means that a learner who has a goal

knows more or less clearly how s/he is going to reach it and the expectations from achieving that goal (Kekwaletswe, 2007). Since the learner is mobile and traverses varied learning contexts, the intentions or plans are subsequently dynamic matters driven by social awareness. That is, actions, changing plans or intentions involve decision-making by way of context and social presence awareness. Knowledge transformation as the object of the activity determines the extent of possible actions.

Since the knowledge transformation activity is dynamic (occurs in varied operations and actions), there must be a relative match between the elements (mobile learners, learning action, rules, means, context, etc.) of the activity, referred to as *mode of operation* (see Figure 33). Accordingly, when the learning activity changes over time, it moves from one relative match to another, from one mode to another, in historical learning phases. Contradictions, and imbalance between the elements and the mode, are the forces driving the activity to transform.

A learner uses social awareness to adjust the knowledge transformation or to adjust to the transformation. The transformation of knowledge manifests in the learner changing knowledge, views, or perspectives internally, making obvious its essence and altering it. Using social awareness, this transformation is either in order to achieve a practical resolution for an immediate learning problem or connected to finding out and creating conditions necessary for the full realization of learning and the subsequent goal of fulfilling a certain university requisite.

Since knowledge transformation happens on the above mentioned basis in historical phases, it is inferred that there are also two types of activities that correspond to the types of transformation. The first type of activity is aimed at pragmatic use of the existing external order of objects. The second type of activity is aimed at the realization of inner potential, at

understanding the conditions of a qualification system. They are discussed in the next two subsections.

6.5.1 Mobile Learning, activity, and environment

The interpretation of findings maintains that the phenomenon of ubiquitous mobile learning is influenced by social awareness (context and social presence awareness) aspects – directly or indirectly mediated. These aspects lie in the mind of the learner as s/he interacts with the learning activity and the environment.

As a point of departure, let me give this observed scenario (from section 5.5.2.2): Molefi (learner A), walking out of a classroom at the end of a formal lecture, passes by a few of his classmates and stops to ask Mpho (learner B, also a classmate) about the lecture they just had. This situation includes other learners who could potentially have provided support or help. Why did he ignore their presence and how did he instead determine or prefer the learning interaction with Mpho?

The concept of activity, social awareness and action helps to interpret the preceding observation by providing an indication of what a certain behaviour or action means in a learning activity. Firstly, the appearance of Mpho and other classmates – their social presence – is very significant because it is on that basis that Molefi decides on the act of seeking learning support and with whom. Secondly, the environmental aspect – the location, learning activity and the fact that it was a good bright day – provides context. Since the action took place outdoor, it is less likely that Mpho would have stopped to provide help if it was raining. By the same token, Mpho would not have provided a positive support without awareness of the context for Molefi's question(s), etc. This is depicted in figure 34.

Fig 34. An interpretation of a mobile learning action

The learner's action is based on the meaning which people, physical objects, other people's actions and ideas have for him/her. The meanings learners attach to actions or the way in which they interpret actions stem from social interaction. Through social interaction, learners develop shared meanings for actions. However, learners do not always interpret all actions, the environment, and situations in the same way; thus, they do not always act in the same way.

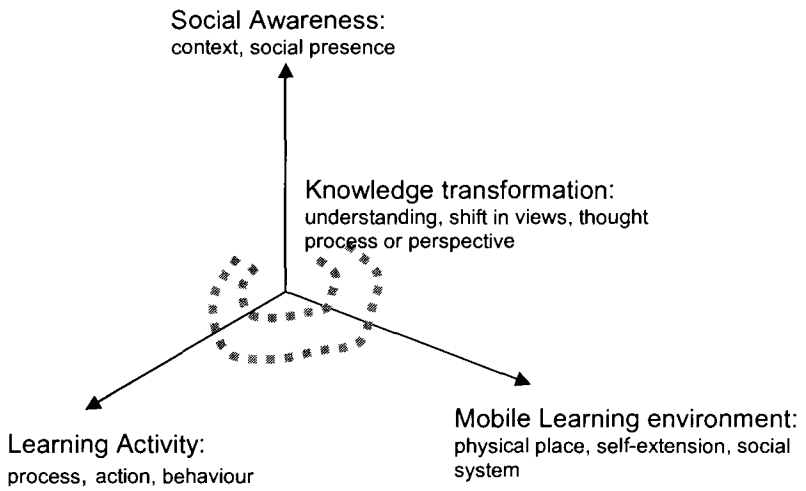

Fig. 35 A social awareness 3-D model (Kekwaletswe, 2007)

Figure 35 shows a 3-D model of the knowledge transformation system. The figure depicts the inter-relationships of social awareness, learning activity and the learning environment. When the three elements interact, knowledge transformation is realized. Mobile Learners' experience of a learning environment is not static. They act on and become part of the

whole environment situation. Mobile Learners' dynamic environmental experiences include experiencing the learning environment as a physical place, as a self-extension, and as a social system (Kekwaletswe, 2007). The three aspects are succinctly interpreted in the following paragraphs.

Firstly, as a physical place the learner is mindful of the noise, the people around, the buildings, the weather situation, etc. This awareness of the environmental features may influence a learning experience and subsequent learner actions. Secondly, the environment is also experienced as what Allport (1961) describes as self-extension. This is when a learner identifies himself or herself with his or her environment and experiences it as a possession – that is, experiencing the environment as his or her personalized living space. This type of experience is often experienced when learners like Pono (see section 5.5.3.3) allude to the fact that they prefer studying in their residence rooms because they know where everything is, so that they have become part of that environment. Thirdly, the learner's experience of the environment could be based on the environment as a network of social interactions – that is, the environment as a social system. In this experience, the environment's significance for the learner is defined in terms of the classmates and peers with whom he or she has interactions or no interactions at all. When learners feel in need of help and support from others, the experience of the environment as a social system may time and again become apparent (*op. cit.*)

The experience of the environment as a social system includes privacy, personal space, territoriality and crowding concepts. Privacy, in this regard, does not mean that a learner does not want interaction with others but rather that he or she wants to regulate when and to what extent s/he will interact with other learners (Kekwaletswe, 2007). This offers the mobile learner the opportunity of regulating his or her social interaction by

setting limits to the interaction with others. Privacy also offers the mobile learner the opportunity to reflect on a learning material in isolation.

In the context of the environment as a social system, territoriality establishes and maintains the relative status and dominance of the members of a social network. That is, it contributes towards the regulation of the permissible social interaction within a group (Altman, 1975) and facilitates a learner's privacy. At UCT, the way learners interact with each other differs within the community of learners and was clearly manifested in the analysis of the empirical evidence in chapter five. For example, a participant commented that "*There is not much to say to people of other cultures in Cape Town, but in Johannesburg I would communicate to any person*" (Table 6, section 5.2). In other words, social interaction with learners of a different social background is not as easy and permissible in Cape Town as it is in Johannesburg, a city with varied and diverse cultures.

Personal space is defined as an area around a learner's body which s/he experiences as his or her own space, and that can be penetrated by selected people under certain conditions. During social interaction, personal space is therefore determined by how close a learner allows others to come to them in terms of physical distance. A learner defines his or her personal space by electing to learn in isolation or through interaction with peers.

In the experience of the environment as a social system, crowding refers to an individual learner's subjective experience of and reaction to the social presence of other learners. The same learner's experience of crowding and how he or she adapts to crowding can vary from one mobile learning situation to another mobile learning situation. The duration of crowding, and individual, social and physical-spatial factors must be taken

into account when determining the influence of crowding (Van Staden, 1983) on a learner's experience of the environment as a social system.

6.5.2 Knowledge Transformation and Awareness of Context and Social Presence

Ubiquitous knowledge transformation is characterized by the provision of insightful ways for identifying the right social presence and the right environment experience. To that point, resourceful and effective transformation of knowledge relies a great deal on the learner's awareness of context and social presence – social awareness (Kekwaletswe, 2007). Social awareness stems from two sources: firstly, from the learner's experience of and interaction with the environment as discussed in the preceding section, and the learner's social background, and secondly from the social resources or service delivery standpoint which incorporates access to ubiquitous learning services such as mobile or immobile interaction devices, network, university schedules or calendars as well as other personalized service delivery activities (*op. cit.*). Services delivery is synonymous with personalized academic social support. Personalized academic social support through social interaction among learners enables knowledge transformation.

Although the knowledge transformation process is a social process between individuals and not confined within the individual, the knowledge creating entities or the ontological dimension is that knowledge is created only by individuals (Nonaka and Takeuchi, 1995). The authors affirm that the key to knowledge creation (what I refer to as transformation) lies in the mobilization and conversion of tacit knowledge. For Nonaka and Takeuchi (1995; p72) "tacit knowledge of individuals is the basis of organizational knowledge creation." However, I see the role of social awareness which influences the problem-driven actions of learners as the basis for

knowledge transformation. Nonaka and Takeuchi's (1995) framework does not explicitly emphasize the construction of shared objective and intention in knowledge transformation; rather, they tacitly delegate that aspect to management as noted by Engeström (1999b). The thesis argues that social awareness coordinates the knowledge transformation activity as a shared object of mobile learners.

In ubiquitous mobile learning, the knowledge transformation activity through social interaction essentially comprises two types of processes which Engeström (1999b) describes as sequences of *formulating/debating a problem* and sequences of *analyzing/debating a problem systematically*.

First, formulating/debating a problem includes sequences of discussion in which mobile learners present an issue or question to be discussed and resolved. Rather than problem solving, the sequences are examples of problem finding. In section 5.3.2 (IM interaction between Molefi and Pono), Pono's knowledge about BEE was fuzzy and therefore needed to be clarified. Since the social interaction did not begin with a clear assigned task or problem to be solved, the problem was found and subsequently clarified during the IM discussion. The social interaction as an action within a learning activity outcome is the knowledge transformation in terms of Pono's fuzzy knowledge perspective on BEE being changed.

Second, section 5.3.4, (IM interaction between Hazel and Neo) is a good example of analyzing/debating a problem systematically. During the interaction, the procedure for building a database was inferred to be explicit but somehow missed or erroneously followed by Hazel. Without necessarily creating new concepts or innovative ideas, the two mobile learners systematically tackled alternative solutions to the database problem by re-assessing what they already knew. The outcome of the

social interaction, as action within a learning activity, is knowledge transformation in terms of change in thought process.

In the preceding sections the research findings were interpreted with reference to the mobile learning environment as a complete learning activity and the importance of social awareness in the mobile learning environment activity. The next section concludes the interpretation of the findings.

6.6 Conclusion on the Mobile Learning Activity

This section is a conclusion on the interpretation that was presented in the previous sections. The interpretation has now resulted in a concluding conceptual model, figure 36.

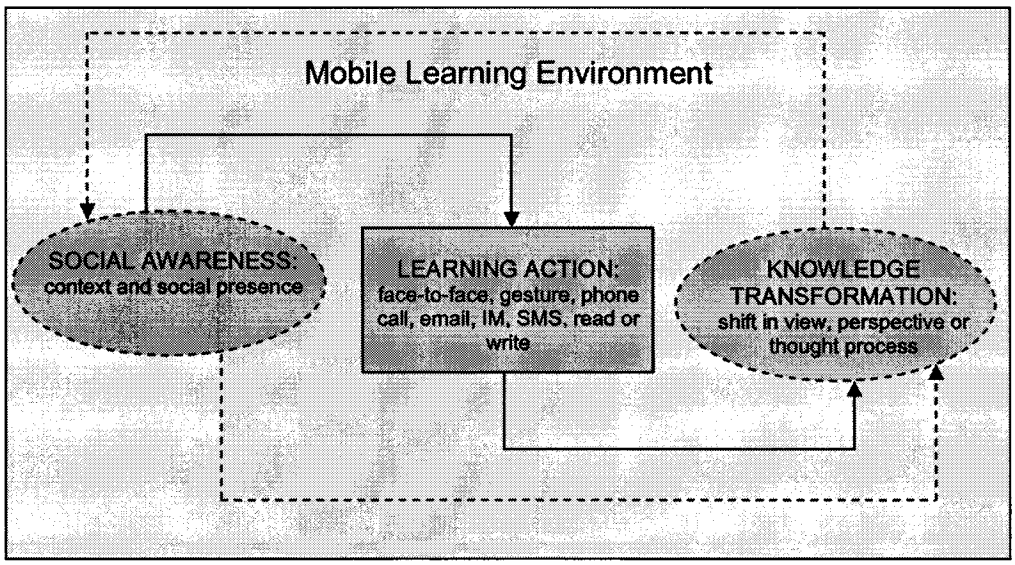

Fig. 36 A ubiquitous mobile learning system model

Figure 36 shows the conceptualization and the interpretation of a mobile learning system. The dotted ovals indicate that which takes place in the mind of the mobile learner. The learning action happens in isolation or through social interaction with peers who share a background. A mobile learning activity system is coordinated by social awareness of the environment experience, the social resources, and the context in which a knowledge transforming activity is undertaken.

A learning action is an interpretation of a situation and it reiterates the learner's place in it. Anything a mobile learner does and says is an action. An action is, therefore, a performance within a social awareness milieu that has called for or shaped that performance in some way. It is a course for dealing with knowledge transformation needs and events of the day by using the interpretive or mediating tools the social system provides. A learning action is a performance enacted within a particular situation or context that is constructed within the surroundings.

A mobile learning environment observation reveals that learners are aware of their own and other's activities. Accordingly, actions reflect an individual learner's knowledge transformation. They serve as cues to others regarding appropriate sharing of learning experiences. Bandura (1986) also suggests that learners can use the actions of others as cues from which they learn explicitly. By watching what happens to others when they engage in different activity patterns, the learner comes to understand that a certain option leads to success while another leads to failure, without engaging in either option personally. In cases where neither the environmental cues nor cues from models are available, learners can still resort to proactive action to obtain information and can create cues by trial and error (Weick and Ashford, 2001). Thus, social awareness cues and actions represent and promote knowledge transformation. Focus on action

also explains the fact that knowledge transformation could be successful as well as unsuccessful.

Transformation of knowledge is pretty much dependent on social awareness cues. Mobile learners transform knowledge by explicitly attending to cues offered by and punctuated from the environment regarding demands, requirements, and opportunities (Weick and Ashford, 2001). Such attention gives the mobile learner a sense of what ought to be done and therefore drives the subsequent actions.

Analyzing the environment for cues regarding what the individual should be doing and how well it has been done, Ashford's (1986) research on self-assessment suggests three assessments about any available cue. Firstly, he suggests that the learner asks whether an event, action, subtle gesture, etc., are cues. Secondly, the learner should ask whether the cue is meant for him or her, and thirdly the learner should ask what the cue means. Even though social awareness cues may be positive or negative, they are, however, fundamental for any learning activity whose outcome is the transformation of knowledge.

To conclude this chapter, knowledge transformation can be viewed in different lenses of the "five Ws": the "know who", the "know what", the "know where", the "know when", the "know why", plus the "know if" and "know how" knowledge. The following table shows the different knowledge contexts pertinent to this research.

Table 13. Knowledge Transformation lenses and scope

Kind of Knowledge (contexts)	Description
Know who	Social resources: social networks, tutors, instructors, knowledgeable peers
Know where	Learning context, location, level of study – phases
Know when	Context, on demand, just-in-time, time of schedules and plans
Know what	Learning material, learning task, university requirement
Know why	Context, motives and goals of the learning activity
Know how	Social interaction, research, action, practice, trial and error
Know if	Possible scenarios, contingencies and outcomes

In a contact university such as the University of Cape Town – where mobile learners attend formal lectures and scheduled laboratory sessions but do most of the learning and reflection away from formal environments – the "know who", the "know how" and the "know where" knowledge are evidently and increasingly important. The mobile learners, thus, need increased awareness of context and social presence as they traverse and experience varied learning environments.

To understand what is needed to support a personalized ubiquitous mobile learning, there is a need to ruminate on the nature and facets of knowledge and its transformation – answering questions like "How does a mobile learner come to know this or that?" and "How does a mobile learner share this or that knowledge?" Through this research I have shown that an informed understanding of social awareness is important to unravel the above questions and consequently, the insight is an invaluable step towards supporting context aware ubiquitous mobile learning.

The next chapter is a reflection on the thesis, giving an overview of the work that was done and an evaluation of the research.

CHAPTER 7: EVALUATION OF THE RESEARCH

7.1 Introduction

This chapter evaluates the interpretive research in terms of significance and contribution to the information systems body of knowledge. The research was based on the ontological and epistemological assumptions that reality and the knowledge thereof are social construction and the focus was on understanding the mobile learners' view of their social environment. This chapter is organized as follows: First, an overview of the research is given. Next, the research questions are revisited and the extent, to which the research has answered them, is discussed. This is followed by an evaluation of the inquiry. The evaluation focuses on the practical and methodological contribution, the relevance of the research and the theoretical contribution of the research. Finally, the thesis is concluded with a discussion of the limitations of the research and an indication of further research that could be undertaken along the lines of this inquiry.

7.2 Overview of the Research

This section aims to help the reader recapitulate the main discussions and the essence of each chapter as presented in the thesis. This is done in ascending order starting with the first chapter.

Chapter one introduced the thesis and premised the research by articulating the challenge of providing a personalized academic social support as an information system problem. I argued for the need and relevance of the research by formulating the problems and challenges faced by South African learners, who are not fixed to specific locations but traverse varied learning contexts. The practical relevance of the research was founded on the expectation that the research would contribute toward

enriching personalized on-demand academic support through social awareness. The ideal social awareness for knowledge sharing and social support is one that is sensitive to the background of a learner. In this regard, my argument was that awareness of context and social presence is a useful characteristic of a learning environment in which a learner is engaged in a learning activity in varied locations. By addressing the challenges a mobile learner faces, I motivated the research questions that drove the rest of the inquiry – where the research explored how mobile learners use social awareness for the purpose of knowledge transformation through social interaction with social resources and the environment. The debate on what signifies mobile learning was highlighted to help the reader understand how the term is used in the research.

The essence of chapter two was to present the theoretical backbone of the research. Chapter two laid out the ontological and epistemological foundations of the inquiry by carefully reviewing existing literature and previous studies to inform the conceptualization of the thesis. This thesis is about context aware knowledge transformations – ubiquitous mobile learning – and the environments that support the phenomenon. Accordingly, chapter two looked at knowledge as a multifaceted phenomenon, examining how knowledge is created, transferred and subsequently transformed. In the research, learning and knowledge transformation are synonymous. Thus, I also examined literature on theories of learning and learning environments where context and culture are interpreted to facilitate learning and knowledge transforming environments. In addition, settings that sustain learning and knowledge sharing were discussed in chapter two.

Reviewing the literature and previous studies enabled me to identify a gap in studies of learning or knowledge where the concept of social awareness

received little or no attention. The research, thus, aimed to close that gap by attaching learning and knowledge transformation to the awareness of context and social presence – social awareness.

Chapter three discussed the various methodological approaches adopted in information systems research. Subsequent to highlighting the various research methods and philosophy common to and typically employed in IS research, I justified the approach and methodology option chosen for this research, namely, to use an exploratory case study methodology and follow the interpretive research paradigm. Under the underpinning theories section, I presented the main ideas and concepts of the theories of Activity, Social Presence and Context Awareness as pertinent to this inquiry of social awareness in a ubiquitous mobile learning environment.

In chapter four I described the research design and the methods used to carry out the exploratory case study at the University of Cape Town. The case study was about social awareness influencing activities whose outcome is knowledge transformation. The chapter pointed out that activities cannot transform into outcomes at once, but go through a process often consisting of several steps or phases. In order for the researcher to see out all these steps or phases there may be a need to use a varied set of data collection techniques to elicit a complete picture of the activity system. To this point, chapter four subsequently described the four research strategies for data collection. The strategies included IM interaction text, environment observation, contextual interviews and the use of a qualitative questionnaire. The reason for employing the four strategies was that findings were likely to be more plausible and accurate if the case study used multiple sources of evidence, which developed converging lines of inquiry.

Chapter four also introduced Contextual Inquiry, an interpretive field research framework that depends on conversations with users in the context of their work, as a relevant approach to collecting evidence. Context Inquiry consisted of observing and talking with learners in their learning environment while they were engaged in authentic learning tasks. In chapter five I analyzed and discussed the actions of learners using the observational and other data collected during the case study. The data were collected in semi-formal and informal learning contexts, where learners needed to "help" other learners or "were helped" through social interaction with peers and the environment. This resulted in quite a large volume of data, and the first objective of the analysis was to bring order in the data. The second objective of the analysis was to see how the phenomena of social awareness and interaction decisions were related for the improvement of the learner's knowledge.

The analysis focused on social awareness – experiences, activities and intentions of learners to transform knowledge through social interaction as they moved about varied learning environments. I used the Activity Theory framework as a lens to help explain intentions, activities and actions of mobile learners. Since this was in essence an inquiry of knowledge transformation attributable to social awareness in a mobile learning environment, Activity Theory seemed suited to the task of analyzing the empirical evidence collected. Each of the four sources of evidence was looked at separately, noting the varied exhibitions and aspects of social awareness cues.

Chapter six presented a discussion and interpretation of the findings from the case study. The main findings of the study as presented in chapter five are discussed and interpreted in terms of their role and how they manifest in a mobile learning activity system. Thus, this chapter commenced with a presentation of the contextual factors and the knowledge transforming

elements (tasks, actions, environment experience and activities) in an Activity Theory model of the mobile learning environment Secondly, it focused on the use and meanings of social awareness for knowledge transformation. The chapter concluded with an interpretation of how social awareness enables the knowledge transformation of a mobile learner and presented a conceptual model of the mobile learning activity system.

7.2 The Research Questions Revisited

In the thesis, the argument is that social awareness coordinates the knowledge transforming-action decisions of learners as they go about experiencing different learning situations and environments. This argument was established by systematically reacting to the research questions shown in Figure 37 below, which is a repeat of Figure 1. The arrangement of these questions shows knowledge transformation as the overarching theme of the research and that it is impacted by awareness of context and social presence. Awareness of context and social presence is synonymous with social awareness. Social awareness influences a learning activity and is looked at in two ways: firstly, the role of context awareness and how it manifests in a mobile learning environment and secondly, the role of social presence and how it manifests.

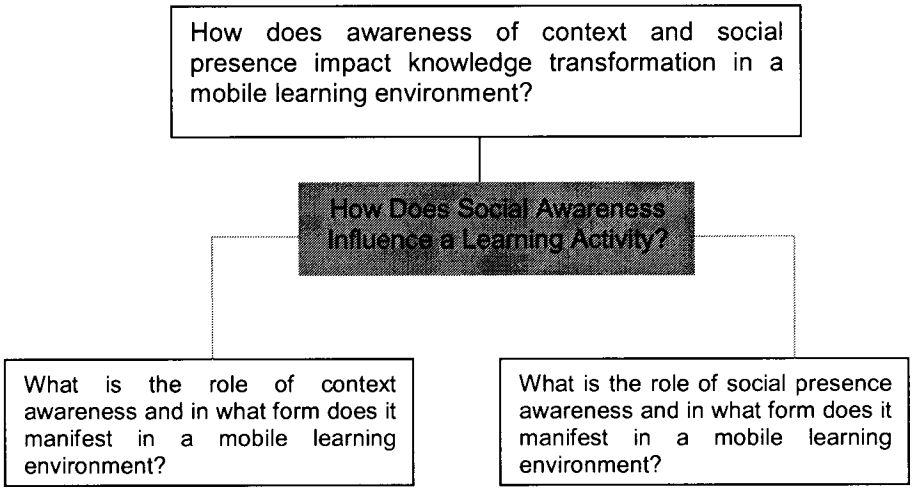

Fig. 37 Research questions revisited

The study was undertaken to address the research question "How does social awareness influence a learning activity?" The data collection and subsequent analyses was to reach an understanding of how context and social presence awareness manifest in a mobile learning environment, where knowledge transformation is the outcome of learners' interaction with others and with the environment. The first step towards answering the research questions was carried out in chapter five with the analyses of the data collected from the four different sources used in the case study. The new knowledge is unpacked in chapter six and briefly re-visited in the following three paragraphs.

The results of the data analyses recapitulated as findings represent new knowledge contributed by the thesis, in two salient points: mobile learning environment is viewed as a complete activity system and social awareness is fundamental in the mobile learning environment activity system. Through evidence in section 5.3 (BEE and the database IM interactions) the research has shown that, indeed, knowledge transforms as an outcome of social interaction coordinated by social awareness. The

new knowledge, in terms of answers to the two next level questions, is summarized as follows:

Firstly, what is the role of social presence awareness and how does it manifest? The study has shown that social presence awareness is significant in three ways: (1) Given that knowledge transforming experiences are ubiquitous, learners use social awareness of available social resources[3] to instantly draw upon for consultation should a learning problem needing immediate attention arise; (2) The mere social presence awareness of other learners engaged in a learning activity provides enough motivation for a learner to engage in a knowledge transforming activity and (3) Awareness of social resources instigates an opportunistic and an on-demand situated learning.

Secondly, what is the role of context awareness and how does it manifest? The study showed that context awareness allows mobile learners to adapt their behaviour and actions to the circumstances in which they find themselves. Learners use context awareness to decide on the appropriateness of a mediating tool. Mobile learners need awareness of where they are themselves and where their peers are located, which is significant in determining the plausibility of a social interaction. Awareness of where the learner is and the peer's location are significant in determining if the location is favourable for a learning activity or social interaction and in determining the proximity, that is, how far a peer is. Learners use social context awareness to find and interact with social resources who share a social background. A learner uses awareness of the demands of a learning task to determine if s/he should seek support from peers or undertake a task in isolation. Mobile learners are sensitive

[3] In the thesis the term *social resource* refers to a knowledgeable peer who could provide personalized academic social support.

to the environment situation and the surrounding atmosphere in determining how they perform a learning task.

In the following section I evaluate the research methodology and the significance and contribution of the research. To guide the evaluation, I applied the accepted criteria and evaluation frameworks.

7.4 Evaluation of the Inquiry

7.4.1 Introduction

In this section I first discuss the rationale behind choosing a case study methodology and then evaluate the research. As a point of departure, I would like to bring the following to the attention of the reader: The goal of this work was to understand and learn about the phenomena being studied – how social awareness impacts knowledge transforming activities where the learner is not fixed to certain learning contexts. Thus, this research can be described by the phenomenology of human learning, where the most advanced form of understanding is achieved when the researcher places himself within the context being studied (Flyvbjerg, 2006). Only in this way can the researcher understand the viewpoints and the behaviour which characterize social actors (*op. cit.*). This point is backed by Giddens (1982) who said "I have accepted that it is right to say that the condition of generating description of social activity is being able in principle to participate in it. It involves 'mutual knowledge', shared by the observer and participants whose action constitutes and reconstitutes the social world" (*op. cit.*, p15).

The case study, as a learning process, allowed me proximity to the mobile learning environment and its social actors. I was able to make insightful discoveries that would not have been possible if survey data were

gathered from a large group of participants, followed by statistical analyses. Here, then, is an evaluation of my learning process.

7.4.2 Evaluation of the Practical and Methodological Contribution

> A scientific discipline without a large number of thoroughly executed case studies is a discipline without systematic production of exemplars, and a discipline without exemplars is an ineffective one (Kuhn,1987).

In this section I discuss how the research contributes as another valuable exemplar. The above remark of Kuhn motivates an argument for the UCT case study – evaluating its practical and methodological contribution according to the "overall evaluation of case studies" (Benbasat et al., 1987). I am aware that Benbasat and colleagues have a positivist background; however, this particular article provides grounds for evaluating the UCT case study as a relevant information systems research strategy.

7.4.2.1 *Why is this case study a relevant approach to information systems research?*

Mobile learning environments, let alone ubiquitous mobile learning – in the context of providing personalized social support – is a fairly new area of research in information systems. For that reason, the case study is particularly appropriate for this problem since research and theory in this area is at the early formative stage (Roethlisberger, 1977). The research problem is a practice-based problem where the experience of the actors (learners) is important and the context of action is critical (Bonoma, 1983). In the case study, the goal was to learn and understand the nature and

complexity of social awareness where learners interact socially for the purpose of transforming knowledge, while traversing varied learning environments.

7.4.2.2 *What is the Research Theme, is it relevant to IS?*

The phenomenon of learning and knowledge transformation is a complex process involving multiple actors and is influenced by events that may happen unexpectedly. For that reason, a case study methodology was well-suited to identify social awareness cues – context and social presence – linking them to how knowledge transforms in a mobile learning environment as a social system. Fundamentally, knowledge transformation and social awareness happen in the mind of a learner, therefore, the phenomenon was observed in terms of the important entities – social interaction and actions of learners – that facilitate and enable it. The information systems research aimed to understand the experience of the learners where the context of their action is important. Understanding experiences of social actors and the context in which the action takes place is significant and relevant IS research.

7.4.2.3 *Research Objective: Where does this topic fit in the knowledge building process?*

The purpose and objective of the research was to learn and understand the phenomenon of ubiquitous context aware learning from the learner's point of view – the goal was to have an informed understanding of "how" and "why" learners interact with each other for purposes of transforming their knowledge, by observing the activity dynamics in authentic learning environment settings. The research aimed at contributing towards understanding the nature of learner actions and social interactions whose purpose is to provide personalized social support for a South African learner, as s/he moves about different learning locations and contexts.

Thus, an understanding of the phenomenon of ubiquitous context and social presence awareness, as experienced by learners, adds to the mobile learning knowledge building process.

7.4.2.4 *Is the Unit of Analysis and Site Selection most appropriate for the IS study?*

This was a case study of how learners, who are not fixed to particular learning contexts, use social awareness for the purpose of transforming knowledge. To that end, the unit of analysis was learners at one university, the University of Cape Town – that is, a single case study. The same individual learners were observed in different learning contexts and locations – to capture the essence of learner mobility. Since the case study uses learners as the unit of analysis, then in essence, the research could have been conducted at any university. However, having said that, the aim was primarily to capture the characteristics and context of a South African mobile learner, hence the University of Cape Town was selected as a research site. UCT's diverse learner population is similar to that of other South African universities – the context and characteristics of the SA university learner is more or less the same throughout the country.

7.4.2.5 *Does the collected data capture the contextual complexity and converge to support the research findings?*

The thesis is premised on the argument that learning or knowledge transformation is not confined to particular locations and is independent of time. To that end, data was collected in informal locations on and off campus to capture the essence of learner mobility in varied learning contexts. Data was collected using four sources – a qualitative questionnaire, mobile instant message text, observation and contextual interviews. Using four sources of data revealed the complexity of social

awareness and ubiquitous mobile learning. The rationale for this effort – four data collection methods – was to get different views of experiences and the learners' subjective interpretation of actions, so that possible contradictions in the data could surface and be addressed.

Firstly, the qualitative questionnaires were completed by many learners in informal campus locations and residences. The questionnaire contribution to the research findings is that it allowed me to draw experiences from a diverse UCT learner population. The mobile instant message text, as a physical artifact, provided data on social interaction mediated by mobile technology – in essence showing that social interaction happening face-to-face is still possible via mediation. The IM text artifact also allowed me to see how knowledge transformed during the learner interaction. That is, how a learner's understanding of the material discussed changed due to the personalized academic support. Observation data was used to capture the phenomenon of situated action, where the learner's experience of the environment influenced learning actions. Contextual interviews captured experiences of learners while they were engaged in authentic learning tasks. In the end the data collected using the four sources converged to support the research findings.

In the next subsection, I evaluate the research taking into consideration the recommendations to attain relevance in IS research suggested by Benbasat and Zmud (1999). Again, I am aware that Benbasat and Zmud come from a positivist background; however, some aspects of how to increase or evaluate the relevance of IS research are applicable to this interpretive research.

7.4.3. Relevance of the Research

Information systems research has been criticized for lack of relevance to IS practitioners. To this point, Benbasat and Zmud (1999) suggested recommendations by which IS research can attain relevance. The following table (14) has been adapted for providing a basis for evaluating the relevance of this research.

Table 14. Dimensions of Relevance of this research

Category	Dimensions of Relevance	Description
Article's Content	*Interesting*	Does the research address problems that are of concern to IS professionals?
	Applicable	Does the research produce knowledge and offer prescriptions that can be utilized by practitioners?
	Current	Does the research focus on current technologies and business issues?
Article's Style	*Accessible*	Can the research be understood (in terms of tone, style, structure, and semantics) by IS professionals? Is it written in a style that professionals would enjoy reading?

(Benbasat and Zmud, 1999: modified)

7.4.3.1. *Is the thesis topic of Interest to practitioners and researchers and focused on current technologies?*

With the proliferation of mobile communication, networks and technology, there is an increased interest from both IS practitioners and the academic community to understand the phenomena of mobility and the tools that best support it (http://caul2006.ncu.edu.tw). Accordingly, there is a growing need to identify emerging research topics that will define the future and advancements in the state of the art and practice of sensor networks and ubiquitous mobile computing (http://sutc2006.asia.edu.tw/).

Under the umbrella of ubiquitous mobile computing, context aware ubiquitous learning is one area that needs further refinement through empirical research. Ideally, context aware ubiquitous learning is the computer supported learning paradigm for identifying learners' surrounding environment, context and social presence to provide integrated, interoperable, pervasive, and seamless learning experiences. The objective of context aware ubiquitous learning is to advance Web and mobile learning a step further from learning anywhere at anytime to being at the right time and at the right place with appropriate learning resources (http://caul2006.ncu.edu.tw), and knowledgeable peers who share a background.

The identification of my research topic is a proactive step to answering a call for emerging research topics in this area (http://caul2006.ncu.edu.tw; Sharples, 2006). In agreement with Benbasat and Zmud's (1999) recommendations, I selected a topic directly related to the current and future interest of stakeholders (researchers and practitioners). Secondly, this topic was motivated by the mobile communication and technology practice, after which I turned to the multi-disciplinary IS literature for the thesis formulation. Thirdly, mobile learning and ubiquitous computing research communities are still discussing issues of mobility and its supporting technologies. The issues that are raised at such international conferences, e.g., the IEEE international workshop on Context Aware Ubiquitous Learning 2006 (http://caul2006.ncu.edu.tw), the IADIS International Conference on Mobile Learning 2006, have potential to influence practice. This research is an extension of works that I have presented to practitioners and researchers at the above international conferences. Since context aware ubiquitous learning is still in its infancy, this research has the potential to influence design and practice in this subfield.

7.4.3.2. *Can the outcomes of the research be utilized by practitioners?*

Context aware ubiquitous learning is meant to support learning by identifying learners' surrounding contextual environment and social presence to provide rounded and seamless learning experiences. The purpose of the research is practice-based and can be directly utilized since its outcome offers a valuable insight on how learners use awareness of context and social presence for purposes of sharing learning experiences. That is, the outcome of the thesis could impact IS and higher education practices where one of the main challenges is the provision of personalized academic support to a mobile learner who traverses varied learning contexts.

The research observed operations and actions that learners use to transform knowledge. To add to its practical relevance, the research used Activity Theory to understand how a learner's activity and action are influenced by the awareness of settings and situations surrounding him or her. In studying context awareness and social presence, Activity Theory provided a lens to look at actions of learners growing directly out of the uniqueness of a given situation. Activity Theory provided a lens to understand how a learner, as the subject with an objective, engages in a knowledge transforming activity. The theory also provided the idea of mediation, where social awareness mediated the learning activity through actions, spoken and written languages, within its context. These insight and concepts of Activity Theory can be applied by IS practitioners involved in ubiquitous context aware learning as an effective diagnostic tool for achieving the ideal of anywhere anytime learning at the right time and at the right place with appropriate learning resources and social networks.

7.4.3.3. *Readability of the thesis: Is the thesis written in a style that can be understood by professionals and academics?*

The thesis, "Knowledge transformation in a mobile learning environment: An interpretive inquiry of ubiquitous context and social presence awareness" was written in a language and style meant to be understood by both an IS professional and an IS academic. In writing up the thesis, I sought to present the reader with an account of a learning process. First, I put forward the research problems and challenges facing a mobile learner, which then motivated the interpretive inquiry. This was followed by an outline of the objectives and the research questions that drive the rest of the inquiry.

To make the thesis easier to read, I provided an outline, in terms of a table of contents, to guide the reader on what to expect in each chapter. Each chapter, thereafter, begins with a short introduction to signal its contents to the reader. At the end, each chapter is concluded with a concise summary of the presentation followed by an indication of what the next chapter is about.

7.4.4 Theoretical Contribution

Opponents of interpretive research often argue that this approach only generates context-dependent knowledge. As a proponent of interpretive research I have used the preceding sections to show how the research was relevant and practice-based, and argued that the results of the research have immediate application for practitioners. In this section and in the final section of this chapter I will also argue that the results of the research generalize to different contexts, and that the research therefore

makes a context-independent contribution to knowledge. First, however, I discuss its theoretical contribution.

> "An idea becomes a contribution, then, when it is constructed as important by the members of a scholarly community, relative to the accepted knowledge constituted by the field's written work." (Locke and Golden-Biddle, 1997).

Barrett and Walsham (2004) write about making contributions from interpretive case studies. Drawing from IS research literature, they examine and outline the processes of constructing and using contributions. Barrett and Walsham distinguish between the *how*, *what* and *when* of contribution, and base their arguments on the work of Locke and Golden-Biddle (1997), Latour (1987) and Walsham (1993, 1995a). The *how* of contribution focuses on how contributions are constructed, and Barrett and Walsham offer three broad strategic concepts to achieve this, based on the work of Locke and Golden-Biddle (1997), and Latour (1987). The *what* of contribution has to do with the content of the contribution, and here their focus is on the work of Walsham (1993 and 1995a). The *when* of a contribution addresses the interesting aspect, due to Latour, that a contribution constructed by an author is a claim to knowledge whose fate is always in the hands of later authors.

In this evaluation of the contribution of the research, I will focus on the *how* and *what* of the contribution that I claim is made by the research, and specifically use the concepts derived from the work of Locke and Golden-Biddle, and Walsham to do this.

Locke and Golden-Biddle (1997) identified two processes of constructing contributions. These are structuring intertextual coherence and problematizing context.

Constructing intertextual coherence refers to the need for texts to establish contribution by re-presenting and organizing existing knowledge so as to configure a context for contribution that reflects the consensus of previous work. I have used chapters two and three to organize the existing knowledge so as to inform the context and problematization of the research.

The second process involves "problematizing" the same literature that provides locations and *raison d'etre* for the present efforts (Locke and Golden-Biddle,1997). Locke and Golden-Biddle identified three ways of problematizing context for the construction of a contribution by the present work, by focusing on the incompleteness, inadequacy, and incommensurability of the existing literature. Incompleteness occurs when it is claimed that the literature is not complete, and that the present work will aim at further development of the literature. Inadequacy is when it is claimed that the literature does not sufficiently incorporate different views and perspectives about a phenomenon, and that the present work will address this aspect. Incommensurability is when it is claimed that the literature overlooks different and relevant perspectives, and makes inaccurate claims. This problematizes the context for the present work to address these inaccuracies (Barrett and Walsham, 2004). In this inquiry, the phenomenon of social awareness and knowledge transformation in mobile environments was problematized as incomplete and inadequate.

Incompleteness was claimed when the review of the literature on learning and knowledge showed that the concepts of awareness of context and social presence were not specifically addressed. Thus, further development was envisaged through the detailed exploration of the concepts. The concept of social awareness in ubiquitous mobile learning has not been given much attention either. Thus, further development of

the concept of social awareness in mobile environments was considered necessary using the interpretive research approach.

Inadequacy was also claimed as knowledge and learning perspectives had mainly been influenced by organizational studies and had not been looked at from the alternative view of social awareness influencing the problem-driven interactions among mobile learners – where knowledge transformation is an outcome of learners providing each other with personalized academic support through social interaction. This research showed that alternative theoretical perspectives such as Activity Theory deserve attention in explaining the multifaceted phenomenon of knowledge creation. Knowledge creation, sharing, transfer, etc. are human-to-human activities. Activity Theory, as shown in the research, provides a general integrated framework that can be used to reframe knowledge creation by focusing on human activities and the individual and collective contexts of mobile learning environments.

Walsham (1993, 1995a) identified four types of contributions that can be made by interpretive (case) studies, through the construction of qualitative generalizations. These are: the development of concepts, the generation of theory, the drawing of specific implications in particular domains of action, and contributions of rich insights which are broad insights not easily categorized as any of the other three types (Barrett and Walsham, 2004).

This work claims contribution with respect to the development of the concept of social awareness. Although studies have acknowledged that knowledge and its transformation is essentially a human-to-human process, the concept of social awareness coordinating the activity has not been developed. This work has shown that awareness of context and

social presence – social awareness – is fundamental to how people decide a knowledge transforming action.

To understand what is needed to support a personalized ubiquitous sharing of experiences, there is a need to ruminate on the nature and facets of knowledge and its transformation – answering questions like "How does a person come to know this or that?" and "How does a person share this or that knowledge?" Through this research I have shown that an informed understanding of social awareness is important to unravel the above questions and consequently an invaluable step towards supporting context aware ubiquitous sharing of experiences. Thus, this work claims contributions of rich insight since its outcome offers a valuable insight on how people use awareness of context and social presence for purposes of sharing learning experiences. That is, how a person shares knowledge and how s/he comes to know "this and that."

Knowledge transformation cannot be divorced from social awareness. The crucial role of social awareness coordinating the knowledge activity and the development of knowledge implies a need for practitioners to refocus attention to social awareness cues in designing knowledge management systems. To the extent that social awareness coordinates the social resources, experience of the environment and the context in which a knowledge transforming action is undertaken, its importance cannot be underestimated. Information systems practitioners ought to understand how social awareness manifest in order to develop a context-aware system. Contribution is claimed from drawing of the preceding specific implications.

Using the accepted guidelines and frameworks, I have evaluated the research in terms of relevance, theoretical contributions, as well as

practical and methodological contributions. The next section discusses limitations of the research and ideas for further research.

7.5 Limitations of the Research and Ideas for Further Research

Although social awareness is argued to coordinate knowledge transforming actions and is experienced by learners regardless of the technology available, social presence of consultable peers was restricted in this study by current challenges including access problems to PDA devices and wireless network hotspots within and outside the university campus. Thus, study participants had limited on-demand ubiquitous social interactions, especially when they moved away from the upper campus. Although the social network and resources are static, through the social presence awareness mechanism in mobile IM, they could move with the learner regardless of location. Lack of consistent access to the wireless network through the PDA also meant incomplete or inconsistent instant message textual interaction (which was required for analysis). Further research could therefore focus on an improved mobile instant message environment as a context-aware social presence environment that supports a mobile learner regardless of learning context.

The title of the thesis is: Knowledge transformation in a mobile learning environment, and so the reader may have expected to see measurements of knowledge acquired or transformed. Although, knowledge transformation (change in understanding) was observed in the study, e.g., BEE understanding and Database setup enlightenment (section 5.3), this inquiry did not intend to assess what happens in the mind of the learner, but to interpret his or her actions. The inquiry gave an interpretation of why and how learners use awareness of context and social presence based on the observed contextual actions and verbal interviews but did not explore

to what extent knowledge is transformed where there is increased or decreased context awareness and social presence. Further research could explore to what extent knowledge is transformed by handing participant learning tasks and utilizing the "before and after" assessment.

The contextual interviews were based on the actual learning action of a participant and therefore were kept concise and to the point. During the interviews this allowed the researcher to capture social awareness as it was instantly experienced. Nevertheless, for further research, this kind of study could benefit from longer interviews where the researcher follows a mobile participant for an extended period of time, asking more questions that may not be directly linked to an action.

The mobile learning environment observations were written purely on what the researcher naturally experienced and saw at the time. Although that allowed a more natural observation setting – e.g., the participants and other mobile learners just behaved naturally – the researcher might have missed other social awareness elements and cues. Further research could capture the mobile learning environment using video cameras and later analyze the experience in more detail – possibly revealing more social awareness elements. A video recording allows for rewinding and forwarding of an incident or picture as much as it is needed. The researcher did not have the benefit of that capability.

The research has allowed me to have an informed understanding of services that a mobile learning environment system should provide; thus, I have begun to explore ways by which I can unfold and operationalize the research outcome. I have proposed a learning environment system envisaged to conform to the mobile learner's needs through its context awareness and social presence mechanism. The envisaged system aims to provide learners; firstly with a presence indication of a knowledgeable

peer (i.e., who among the peers is available for interaction), secondly, how best to get in touch with that classmate or peer (based on location and proximity) and thirdly, how to find the material that the learner really need, and lastly how learning portfolio can be recorded for better personalized service when the learner reconnects to the system. This ubiquitous learning environment system is designed with the learners' social awareness and most needed services in mind.

7.6. Conclusion

Human beings are unique in their capacity for rational action. In the research, the rationale for action was determined by awareness of context and social presence. Yet again, a living human could be defined in part by their capacity for rational decisions, where a phenomenon is action based on responses determined by environmental conditions. The research observed and then attempted to understand, through careful analysis and interpretation of empirical data, the phenomenon of knowledge transformation in terms of social interaction influenced by social awareness conditions. Paraphrasing Heidegger, the question can be asked: Can phenomenology, if we involve ourselves deeply with it, do something with us? An answer is provided by the research: By having an empirically informed knowledge of how learners use context awareness and social presence in a mobile learning environment – the actions and operations a learner uses to solve a learning problem – we can improve social awareness cues and aspects of environments where knowledge transformation takes place, and therefore influence the phenomenon of knowledge transformation.

This is the practical contribution of the thesis: Providing insight on how personalized academic support could be enriched through improving social awareness cues and aspects of mobile learning environments,

where knowledge transformation takes place. The research gave insights on how mobile contexts are "created" and to what extent the learning actions could be positively mediated by mobile devices in ubiquitous learning situations. Furthermore, in the research, where learners use social awareness to socially interact with others in different locations, communication technologies become the emerging context of interaction. Accordingly, the use of technology no longer simply takes place in contexts but instead, they create contexts of interaction.

To provide such personalized social support to learners could be a fundamental step to resolve the practical challenge facing South African education or organizational institutions. However, before we can provide an ideal personalized social support, we need to understand the phenomenon of social interaction in the context of social awareness. The research can inform IS practitioners in the advancement of context aware computing and ubiquitous learning in two ways: firstly, context aware devices – wireless or wired – ought to be designed based on and should be sensitive to the learner's contextual situation, mundane activities and his or her experience of the environment. Secondly, context aware computing and ubiquitous learning information systems ought to be able to mimic or transmit the social awareness of the learner as s/he moves about varied learning contexts. For the reason that people use social awareness to influence an action decision, the findings of the research and their practical relevance need not be confined to the South African context.

This research has been a learning expedition towards understanding the phenomenon of ubiquitous mobile learning where knowledge transformation is the result of social awareness activity. The learning and the writing up of the thesis have been invaluable experiences for me. My sincere hope is that the reader will also have experienced this sense of discovery that for me, characterized the research study.

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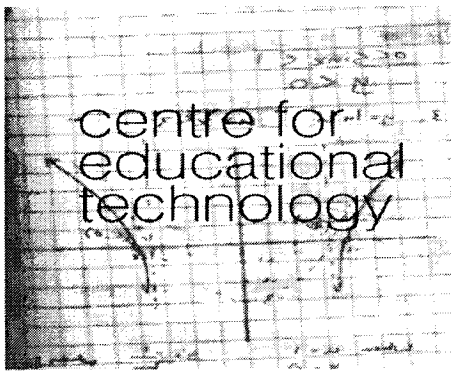
9.0 Appendices

Mobile Learning Project

Communication Interception Consent Form



The Centre for Educational Technology enables, promotes and investigates the integration of learning technology in teaching and learning at the University of Cape Town, and in higher education.

The study is to determine how Social Presence Awareness (mobile IM) Can facilitate sharing knowledge and learning experiences

In this study context and social presence awareness is availed through wireless (WiFi) networks. The interaction is facilitated via a Jabber IM client, *iMov messenger* –installed on PDAs. For the purpose of the study the interactions are logged through the Jabber server for research analysis. Essentially, we will need to intercept the IM communications to allow us to capture text artefacts. Interception of online communications (e.g. logging it on the server) is covered by the RICPCI Act ("REGULATION OF INTERCEPTION OF COMMUNICATIONS AND PROVISION OF COMMUNICATION-RELATED INFORMATION ACT") - see http://www.internet.org.za/ricpci.html

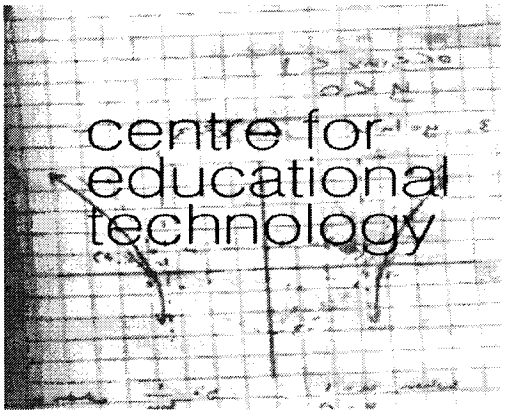
In effect this means that we need to obtain written permission from the parties whose traffic will be intercepted. We guarantee that all text artefacts will be kept anonymous and confidential and will be used solely for research purposes. No other party will have access to the artefacts. Please be advised that your participation in this study is voluntary and that you are able to opt out at any time. By signing this consent form you are warranting us permission to intercept your communication and use the text artefact for the sole purpose of studying ubiquitous context and social presence awareness in a mobile learning environment.

FirstName.....LastName.....

Signed.....Username..... Date.....

Mobile Learning Project

PDA RELEASE FORM



The Centre for Educational Technology enables, promotes and investigates the integration of learning technology in teaching and learning at the University of Cape Town, and in higher education.

The Study determines how mobile instant messaging
Can facilitate interaction and knowledge sharing

You are given the WiFi-enabled Portable Digital Assistant (PDA) to support your mobility and solely for the purposes of investigating the value it may add to educational environment. The PDA is installed with *iMov Messenger*, the Jabber client we will be utilizing for presence awareness as well as the appropriate and opportunistic instant interaction. Although this is the primary reason for handing out the handheld device, you are very free to make use of other PocketPC tools, e.g. the wireless internet, entertainment apps, etc etc., per your interest. Having fun is the ultimate goal.

You are expected to exercise the utmost care and protection for the PDA and accessories. You will return the device and its contents at the time agreed on. Your participation is invaluable and yet voluntary (i.e, you may opt out anytime).

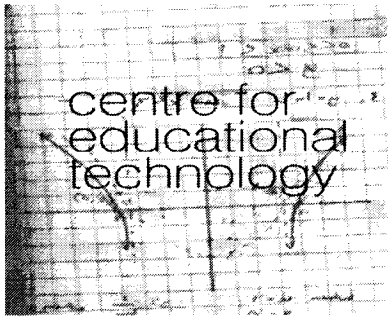
Your participation is highly regarded and appreciated. By signing below, you agree to return the handheld device and its contents in the shape and form that it was received, on ..... You also agree to fully participate (interact with peers using imov messenger at all opportunities).

First Name.....Last Name.....

USERNAME.....SIGNED.....DATE.....

Mobile Learning Project

Qualitative Questionnaire



The Centre for Educational Technology enables, promotes and investigates the integration of learning technology in teaching and learning at the University of Cape Town, and in higher education.

This questionnaire is to get your view and experience in using technology to communicate for a learning purpose. Your participation is very important and yet voluntary (You may opt out). There is absolutely no wrong response. Thank you for being part of the mobile learning project research.

Gender.....
Program.....Year of study.....
Faculty.....
University Residence..... off Campus Location.....

Questionnaire Key Terms:

- **Communication** means interaction whose outcome is learning or knowledge sharing.
- **Interaction** is in the context of learning and knowledge sharing such as asking or responding to a question about a certain topic, and/or clarifying a learning problem.
- **Mobile Device** means handheld tool that is wirelessly connected, e.g. cell phone or PDA.
- **Peer** means another learner who may be able to help with a learning problem.
- **Learner** is a student enrolled in at least one course at the University of Cape Town.

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PART 1:

1. When faced with a problem in your studies and needing help on a certain topic, how do you usually communicate with your peers, besides face-to-face meetings?

2. What is your reason for communicating in this way?

3. Have you used the following to communicate with peers?

   - Online chat yes/ no
   - Electronic mail yes/ no
   - Instant message (IM) e.g. Yahoo, MSN yes/ no
   - Short message service (SMS) yes/ no
   - Mixit yes/ no
   - WebCT yes/ no
   - Other (please state).....

4. How do you decide which method to use in communicating with your peers?

Scenario:
Imagine you had a mobile device on which you could see a symbol indicating where your peers are, e.g. a picture of the library would mean they are in the library studying or a house and shopping cart would mean they are at home or shopping, respectively. Your information would also be available to your peers, and automatically updated, requiring no effort on your part. You would always have the option to turn the device on or off, giving you full control.

With such a handheld device, you could be aware of other's situations: what they are doing and where there are. That is, you have access to the same knowledgeable peers (to help with a learning problem) regardless of time and location.

Assuming you would use such a system:

1. Who would you be willing to share this type of information with, mostly? (e.g., peers, classmates, group project members, friends, etc)

2. From which locations would you be willing to contact all of them? (e.g. work, home, gym, supermarket, UCT, hospital, church, lab, library etc).

3. Which locations, if any, would you only share with certain learners? (e.g. my classmates can't know I am with my boyfriend/girlfriend at the movies).

4. Would you keep the mobile device on at all times? Please, explain

5. In what situations would you turn the mobile device off? Please, explain.

6. If you wanted to communicate with a peer who had the same mobile device, how would you consider their present location and activities?

7. What other things, if any, would you take into account before communicating?

8. If the device could let others know more information about your situation (other than your location) what other information would you be willing to share?

9. In your view, what positive effects could such a device have on your social life? (in terms of learning from others anywhere, anytime) Please explain.

10. In your view, what negative effects could such a device have? (In terms of learning from others). Please explain.

PART 2 (a):

Scenario:
You are doing a tutorial and preparing for an exam. You get stuck (run into a learning problem) and urgently need to communicate with a peer, via a mobile device.

1. To what extent do you consider the personal aspects of another before seeking help? Tick

   Never Sometimes Always

2. To what extent do you consider the distance between you and a peer before seeking help?

   Not important Important Very important

3. Does the sense of distance between you and a peer have an effect on how you communicate? (e.g. I would likely seek help from a peer in Cape Town than the one in Durban because...)

4. Do you prefer to get help from someone of the **same:**

a) Age:	Yes	No	Mostly
b) Gender:	Yes	No	Mostly
c) Background:	Yes	No	Mostly

5. Which of the following learners are you **most likely** to communicate with?

   a) A classmate with the same cultural background
   b) A classmate with a different cultural background

   Please explain:

6. To what extent do you interact with a peer if you know s/he speaks the same language?

   Hardly More often

7. To what extent do you interact with a peer if you know s/he is involved in similar learning activities?

   Hardly More often

8. To what extent do you interact with a peer if you know s/he is in a different faculty?

   Hardly More often

PART 2 (b)

Scenario:
You are doing a tutorial and preparing for an exam. You get stuck (run into a learning problem) and urgently need to communicate with a peer, in real time via a mobile device.

9. How would your knowledge of where a peer is (their location) affect your interaction?

10. How would your knowledge of what a peer is doing (current activities) affect your interaction?

11. To what extent would you interact with your peer if you knew s/he was in class?

    Never medium High

12. To what extent would you interact with a peer if you knew s/he was in the university cafeteria?

    Never medium High

13. To what extent would you interact with them if you knew s/he was in residence or flat?

    Never medium High

Part 2 (c)

1. In your experience, **when** does most of your learning **best** happen? (Put a number next to the five alternatives. 1 being most & 5 being least)

    a. During the lecture/scheduled lab sessions
    b. During interaction with peers within campus
    c. During interaction with peers at residence or flat
    d. During working alone on campus
    e. During working alone at residence or flat

    In your experience, **where** does most of your knowledge exchange and sharing **best** take place? (Put a number next to the five alternatives. 1 being most & 5 being least)

    a. lecture/scheduled lab sessions
    b. interaction with peers within campus
    c. interaction with peers at residence or flat
    d. working alone on campus
    e. working alone at residence or flat

2. How do activities and behaviours of other learners affect how you learn?

3. To what extent are you aware of things going on around you, during a learning activity?

    Low Mid Highly

4. Kindly mention examples of *things* you become aware of during a learning activity?

5. How does awareness of the surroundings (e.g. sounds, movements, room temperature, other people. etc.) influence your communication with peers?

6. Do some places make it easier or harder to communicate with peers? Yes No

7. In your experience, which places make it easier to communicate with peers?

8. To what extent do emotional states (moods) of other learners affect your learning actions?

9. In your opinion, how is the awareness of your peer's current situation (e.g. s/he is stressed, happy, sad, cheerful, etc) helpful in interacting with them?

14. Would you consider your recent personal experiences with them? (e.g. I wouldn't dare seek help from them if we had a conflict)

PART 3

Have you communicated via instant messaging (IM), Online Chat, Mixit or WebCT (That is, have you had an immediate or synchronized text message interaction)? **Yes** **No**
If yes, please continue...

Scenario 1:
You are alone in your room preparing for an exam and get stuck with a learning problem. Peers or other learners who could help are in different locations.

1. What is your initial reaction?

2. Is it important to you to know someone's availability before you decide to interact with them?

   Not important Important Very important

3. How does this awareness of availability influence your learning actions?

4. Imagine that learners who could help you when you get stuck are 'always' available via instant messaging or online chat room. To what extent would that make your learning easier?

Scenario 2:
You are alone in your room and interacting (sharing learning experiences) with a peer (instant text messaging each other) via instant messaging (IM), online chat etc.

1. Although you are in different locations, to what extent do you experience a sense of being in the same room with the other?

2. In your experience, are you able to sense the other's moods (e.g. is s/he into the interaction, happy, sad, bored etc)? Please explain

3. In what ways are you able to show emotions during IM interaction?

4. To what extent do you experience that you are sharing knowledge (that is, the interaction is helpful)?

5. To what extent were there times, if at all, during the interaction you got involved in other tasks (multi-tasking)?

6. Think of a previous time when you shared knowledge with a peer(s) in order to complete a learning task. To what extent is your experience similar during IM interaction?

7. In your experience, do you feel that instant messaging or online chat could facilitate knowledge sharing?

8. Did you personally experience some learning (positive help, knowledge sharing) during the instant text interaction?

OBSERVATION FORM

UCT Observation Location:		
Participant(s):		
Date:	**Time Start:**	**Time Ends:**
Description of Participant(s) Attire etc.:		
Description of Weather:		
Description of others:		
Visible tools, devices, language etc. used:		
Description of Participant Activity/Actions:		

Mobile Learning Instant Message (IM) Log

Message to	Message from	Message body
ond@jabber.uct.ac.za	uad@jabber.uct.ac.za	testing logging
kra001@jabber.uct.ac.za	mbm001@jabber.uct.ac.za	wsup?:-)}
dbra@jabber.uct.ac.za	ond@jabber.uct.ac.za	Wat r u up to? Testing...
ond@jabber.uct.ac.za/	dbra@jabber.uct.ac.za	Wrking late. Where u at?
dbra@jabber.uct.ac.za/	ond@jabber.uct.ac.za	In the damn Com Lab
ond@jabber.uct.ac.za/	dbra@jabber.uct.ac.za	Lolololololololo....
ond@jabber.uct.ac.za	dbra@jabber.uct.ac.za	u got's to work 2.
ond@jabber.uct.ac.za	dbra@jabber.uct.ac.za/	>:-o
dbra@jabber.uct.ac.za	ond@jabber.uct.ac.za/	YEBO, I am here Wed nites... just to cheer up ur peeps
dbra@jabber.uct.ac.za/	ond@jabber.uct.ac.za/	By the way, u need to add all the tutors as your contacts, so that you can see n interact wit them while they work
ond@jabber.uct.ac.za/	dbra@jabber.uct.ac.za/	they been adding me one by 1. will get round 2 doing it tho
dbra@jabber.uct.ac.za	ond@jabber.uct.ac.za/	LOL
dbra@jabber.uct.ac.za/	ond@jabber.uct.ac.za	BTW, do u know if the third ethernet port under the desk is active? I wan plug the hotspot access in it...
ond@jabber.uct.ac.za/	dbra@jabber.uct.ac.za/	no idea
ond@jabber.uct.ac.za	dbra@jabber.uct.ac.za/	one way to find out...
dbra@jabber.uct.ac.za/	ond@jabber.uct.ac.za	nice...:'(
ond@jabber.uct.ac.za/	dbra@jabber.uct.ac.za/	sorry about that....P-)
dbra@jabber.uct.ac.za/	ond@jabber.uct.ac.za	How abt a mini Hub, got it?
ond@jabber.uct.ac.za/	dbra@jabber.uct.ac.za	got 1 but is there a 2 prong plug/adaptor for power?
dbra@jabber.uct.ac.za	ond@jabber.uct.ac.za/	I got one, yeah!
ond@jabber.uct.ac.za/	dbra@jabber.uct.ac.za	you can come n get it if you want
dbra@jabber.uct.ac.za/	ond@jabber.uct.ac.za	ON my way chief!!
dbra@jabber.uct.ac.za	mbm001@jabber.uct.ac.za	hey there. can students access their UCT email from their cellphones at home or wherever? They need to put in an incoming and outgoing port. Do you know how to do tha?
dbra@jabber.uct.ac.za	oms004@jabber.uct.ac.za/	why r u here so late
oms004@jabber.uct.ac.za	ond@jabber.uct.ac.za	how is it going?
ond@jabber.uct.ac.za	oms004@jabber.uct.ac.za	hey.this is a typical ladies toy ,as woman love to chat
oms004@jabber.uct.ac.za	ond@jabber.uct.ac.za	U know, but we need to still say sumthin too....>:D
oms004@jabber.uct.ac.za	rmt001@jabber.uct.ac.za	Hello
rmt001@jabber.uct.ac.za	oms004@jabber.uct.ac.za	hey sweetie
oms004@jabber.uct.ac.za	rmt001@jabber.uct.ac.za/	how ya doin?
rmt001@jabber.uct.ac.za	oms004@jabber.uct.ac.za	not so good.too much work to do

wry001@jabber.uct.ac.za	ond@jabber.uct.ac.za	I will need some help with this guys, wat d u think?
gsm001@jabber.uct.ac.za	mond@jabber.uct.ac.za/	I can c u r on now!
ond@jabber.uct.ac.za	gsm001@jabber.uct.ac.za	I'm in now, can u see me?
gsm001@jabber.uct.ac.za	ond@jabber.uct.ac.za	Dis sud support mobility arnd d lab
ond@jabber.uct.ac.za	gsm001@jabber.uct.ac.za	Excellent
gsm001@jabber.uct.ac.za	ond@jabber.uct.ac.za	ur presence sud be felt frm the oda corner of d lab
ond@jabber.uct.ac.za	gsm001@jabber.uct.ac.za	wat is darly's contact add?
gsm001@jabber.uct.ac.za	ond@jabber.uct.ac.za	phone or email
gsm001@jabber.uct.ac.za	ond@jabber.uct.ac.za	dbra@uct.ac.za or dbra@jabber.uct.ac.za
mbu001@jabber.uct.ac.za	dbrandre@jabber.uct.ac.za	I can give you the settings but i'm not sure that it will work. I think it only works on POP servers. We use SMTP.
oms004@jabber.uct.ac.za	dbrandre@jabber.uct.ac.za /	Just seen your message now. I guess you'll get this some other time. Deadlines lurking. Gotta get the work done.
mjr001@jabber.uct.ac.za/	kku001@jabber.uct.ac.za/	hello?
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	Hi
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	how's ER group with lit survey, they too relaxed about it?
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	They must have a a first draft by tomorrow so they better get unrelaxed
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	oh my partner doesnt say much 2 me so its almost like hassling her for stuff. Neway do work.. will bug u agen in 5 mins
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za/	wat u saying i cant hear u
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	my ER partners are the same
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	shame...Miles looks so scatter brain. and he doesn't make ye contact.. we should have just been partner
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	s
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	lol ya wel its a little bit late
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	i know. but shame diaz singled u out and aimed for u... he coudve chosen any ER, couldn't he? hahahah
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	ye he could have :(
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za/	But mine was in his top 10 list
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	still he's evil. anyway...i'll leave u alone 4 a bit... work... u probly gna need to do a lot coz of them for 2mrw
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za/	ya and cos of him
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	i'm gna be girly now, do u think i'm getting cross for a small rthing... I basically have to do her section also

kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	lol, u sound like some one i no
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	i don't even no y u mad?
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	i know...thats why i sed i'm being girly..
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	u can b girly u wearing pink today
mjr001@jabber.uct.ac.za/	kku001@jabber.uct.ac.za	okay..but i'm like kaie kaoom anyway so i'm gna be pissed about this... she didn't do her part and I already did intro and otline
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	lol ok :)
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	jsut be pissed man its leke
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za/	Leka
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za/	:(
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	:'(cry man, i know u wanna
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	yoh, i do...i just emailed my sis and told her i'm crying by her tonight
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	anyway must be off sabs leaving
kku001@jabber.uct.ac.za	mjr001@jabber.uct.ac.za	lol ok u enjoy
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	bye, gud luck...see u Monday
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	oops monday holiday
mjr001@jabber.uct.ac.za/	kku001@jabber.uct.ac.za	see u Tuesday
mjr001@jabber.uct.ac.za	kku001@jabber.uct.ac.za	ooh dont come in Tuesday
mjr001@jabber.uct.ac.za/	kku001@jabber.uct.ac.za	see u Wednesday
privacy-level-2@mxit.co.za	mjr001@jabber.uct.ac.za/	privacy-level-2
mjr001@jabber.uct.ac.za	privacy-level-2@mxit.co.za/clockspeed	privacy-level-2
mjr001@jabber.uct.ac.za	privacy-level-2@mxit.co.za/clockspeed	privacy-level-2
privacy-level-2@mxit.co.za	mjr001@jabber.uct.ac.za	privacy-level-2
lgo001@jabber.uct.ac.za	sdn001@jabber.uct.ac.za	sorry,abt yesterday.i've been problems connecting
nga001@jabber.uct.ac.za	sdn001@jabber.uct.ac.za	hei,why are u off.pliz send me a pliz call when u get this coz we need to chat. Otherwise enjoy ur day
ond@jabber.uct.ac.za	sdn001@jabber.uct.ac.za/	why are u off.just came from ur office to check on u
gsm001@jabber.uct.ac.za	kra001@jabber.uct.ac.za	JUst testing , aight????
privacy-level-2@ched.uct.ac.za	kra001@jabber.uct.ac.za	privacy-level-2
kku001@jabber.uct.ac.za	kra001@jabber.uct.ac.za	just a test...
sdn001@jabber.uct.ac.za	ond@jabber.uct.ac.za	wher r u now?
btlpha001@jabber.uct.ac.za	ond@jabber.uct.ac.za	just a test, ok!
lgo001@jabber.uct.ac.za	sdn001@jabber.uct.ac.za	well I guess u are buzy,but we were suppose to work...
lgo001@jabber.uct.ac.za	nga001@jabber.uct.ac.za/	hey tswana man,clever sap person.lâ€™m sure u got 100% 4 th tut.
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za	o ikgatha ka nna

nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za	wat r u up 2 @ this hr
lgo001@jabber.uct.ac.za	nga001@jabber.uct.ac.za	Iâ€™m chillin wit my frends
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za/	Who
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za	do I knw them
lgo001@jabber.uct.ac.za	nga001@jabber.uct.ac.za	what does that tswana phrase mean?
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za	which 1?
lgo001@jabber.uct.ac.za	nga001@jabber.uct.ac.za	Iâ€™m wit khii,nkobil
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za/	Ok
lgo001@jabber.uct.ac.za	nga001@jabber.uct.ac.za	oikgatha kanna
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za	wat r gossiping abt
lgo001@jabber.uct.ac.za	nga001@jabber.uct.ac.za	wat does it mean?
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za	making fun out of me
lgo001@jabber.uct.ac.za	nga001@jabber.uct.ac.za	we don gossip,we discus personal things
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za	Men
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za	do I knw ncoli
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za	is ur pda frozen
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za	kana le gale u don knw hw 2 use it
nga001@jabber.uct.ac.za	lgo001@jabber.uct.ac.za/	did I say sumthing bad
kra001@jabber.uct.ac.za	privacy-level-2@ched.uct.ac.za/UCT	privacy-level-2
dsp001@jabber.uct.ac.za/	kra001@jabber.uct.ac.za	Ok, let test this one
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	Sure
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	how long do u have cause i'll need a day a
dsp001@jabber.uct.ac.za	kra001@jabber.uct.ac.za/	finisdh the sentence ma'am
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	Wassup
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	u hungry
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za/	where u at?
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	at the moment there are 8 ppl working in the actuarial field in Bots.
dsp001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	True
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	why do u think there is less qualified actuaries in this region?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	have not really thought about it
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	why d u wan b an actuary?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	first it was the money
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	deals with numbers, it's interesting and challenging
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	but that it no as good as it once was
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	job security is another factor
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	actuaries are hardly ever fired
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	the problems you encounter are interesting too
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za/	wats d entrance requirement for d actuary science grad program?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za/	A math, stats or other science

		degree is sufficient
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	thanx for the insight, neh?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	Sure
mnypat004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	Mma ke thole gore dilo di vaa shapo...
mnypat004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	OK, got it!!

SECTION 5.3.2 MOBILE IM ACTIVITY ONE & TWO STARTS HERE

kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	Sup,
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	where are you now?
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	nuttin much, am in my room at res. d we stil hav dat meetin?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	yeah as far as i know
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	where are u now?
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	I meant wit Prof Loeto abt our paper.. it is tmr at 9am, rite?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	actually it is at 9:30
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	Oh, thanks!!
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	what did the Prof say?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	did he like it?
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za/	he says to add bits abt BEE stuff, dnt know wat dat is
dsp001@jabber.uct.ac.za	kra001@jabber.uct.ac.za/	am at Lesbiek Res, for now
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	oh? I guess that makes sense. It is south africa after all. I sometimes forget stuff like that
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	may be I can help, what do you need help in?
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za/	wat exactly is BEE? wat does it stand for n wat does it involve n stuff..:-)
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	oh really, am at the library.
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	Are you asking me? Black Economic Empowerment.
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	They are trying to redistribute weath to those that were "previously disadvantaged"
dsp001@jabber.uct.ac.za	kra001@jabber.uct.ac.za	Gud, since u r arnd enuff info, perhaps u can help...
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	it 's kinda cool actually. Never

		seen such a comprehensive affirmative action program anywhere
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	email me what u 've done so far.
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	affirmative action, d u mean like in d US?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za/	kinda but much more involved.
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	what exactly about BBE?
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	how r dey distributin wealth n to who?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	in the US it is just if you are a minority and you have the same qualifications as a white person when applying for the same thing then you should get it
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	am cool, tomorrow before class sounds like a plan. don't stress will figure it out tomorrow
dsp001@jabber.uct.ac.za	kra001@jabber.uct.ac.za	R u aware of d BEE n how it is done in dis country?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	in south africa there are quotas of how many 'black' people should be in every organization
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	it's not that I like to come late. beauty takes time
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	Quotas? ..as in % of positions dey shud have?
kra001@jabber.uct.ac.za/	dte004@jabber.uct.ac.za/	Yes that is it, priority is given to 'blacks'
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	wat if no black citizen qualifies, wat happens?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	well then you have a problem
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	you may get black non citizens i think but I am not sure
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	well, am not sure, will ask for help at commerce help desk and see what I can do. will definitely make a plan. give me couple of hrs
dsp001@jabber.uct.ac.za	kra001@jabber.uct.ac.za/	how long r u in d library for? I mite come up der
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	what can I say, that's the way it is. Anyways, how about u can wake me up at 6am so I can be on time to rescue u?
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	so BEE is abt helpin black people catch up, I see
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	yeah after 400 years of predudice

		this country needs dat
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	how d we organize d paper now dat we need to add d stuff?
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	yeah we can give most of it to miss p. she was kinda slacking on the other sections
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	will be here till i chunk out. would be cool if u join me. i'll continue to find out stuff on BEE though
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	ms p doesn't kno jack abt BEE, but said she will check with d help desk
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	better early than late, gave my word that i'll help u bfr class, if that's what it takes, waking up at crack of dawn, let it be
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	r u at Res? I need to give u d doc so u can add stuff
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	yeah that is the right place for her coz she surely needs to learn ...☺
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	i'm on campus right now by the stats tutors office
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za/	so are u coming? pls bring me a sandwhich, am super hungry.
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	u seem to kno enuff abt BEE stuff, y dnt u rite dat section n den give the rest to ms p to edit. U can find her at library
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	shoot u, what happened to all the cash u had at the beg of month. Sure u aint on foreign substances.
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	so r u coming or not?
dsp001@jabber.uct.ac.za	kra001@jabber.uct.ac.za	yeah as soon as I get some to eat- tryin to cook now
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	Man, i know it in general but not the deep stuff. I will try do a little something something. But I will need help
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	got to concentrate on my stats test comin
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	ok, I will let u do ur stats now. let me finish wit my cookin...
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	so when d we get to meet so we can go over stuff b4 Prof meetin

kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	pls count me in, bring the food with u. or else
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	so u think...
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	don't know 8
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	is 8 cool?
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	I shud b on campus then, I guess we meetin at d usual place, rite
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	aight, let me get go and find out on BBE. see u. I'll be at the coomerce section of the library. won't miss me. cheers!
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	sounds like a plan see you then
dsp001@jabber.uct.ac.za	kra001@jabber.uct.ac.za/	we meetin at 8, ok?
dte004@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	well got go now, will catch up with u later.
kra001@jabber.uct.ac.za	dsp001@jabber.uct.ac.za	sound like a plan. 8 will be. Later
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	hey gud luck wit ur stats, got to deal wit dat comp sci projct, u probably did it last year, so mite bother u again tmr
dsp001@jabber.uct.ac.za	kra001@jabber.uct.ac.za	the usual place
dsp001@jabber.uct.ac.za	kra001@jabber.uct.ac.za	hey c ya later!!
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	might want to reconsider that, did not do too well on it
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	you are welcome to it anyways though
kra001@jabber.uct.ac.za	dte004@jabber.uct.ac.za	well got go now, will catch up with u later
dte004@jabber.uct.ac.za	kra001@jabber.uct.ac.za	aight, c ya later. Thanks

SECTION 5.3.4 MOBILE LEARNING ACTIVITY THREE STARTS HERE

lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	this is quite interesting
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	hi there so how is da studying
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	Slow
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	and u
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	slow as well,so where are you
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	did u finish the peopleware stuff
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	i'm in the lab and u
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za/	oh yes its quite interesting
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za/	I'm in the library, want to study another module

ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za/	Hectic
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	sounds like ku r on a roll
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	well I really want to pass this course
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	i'm still stuck on the stuff about office space
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	yep its not optional
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za/	what exactly maybe I can help
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	so how did u find the hr paper
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za/	the stuf on office space is rea
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	really confusing
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	how did u find the hr paper?
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	very technical hey!
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za/	vt t
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	I was trying to fix the login but i'm stuck
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	I was tryin to fix the login but i'm stuck
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	can u help?
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	lebz login is giving issues
ble001@jabber.uct.ac.za	kra001@jabber.uct.ac.za	hellos, I am li'l confused abt sumtin, u got a min?
lal002@jabber.uct.ac.za	kra001@jabber.uct.ac.za	hellos, I am li'l confused abt sumtin, u got a min?
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za/	hey, what's the error?
kra001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	yeah i've got time. wats up?
kra001@jabber.uct.ac.za	ble001@jabber.uct.ac.za	yep what's the problem?
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	its not getting the employee details
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	from the emp table
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	but is it ppulating at all
ble001@jabber.uct.ac.za	kra001@jabber.uct.ac.za	waz d diff btn synchronous communication n asynchronous?
lal002@jabber.uct.ac.za	kra001@jabber.uct.ac.za	waz d diff btn synchronous communication n asynchronous?
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	No
kra001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	not too sure!
kra001@jabber.uct.ac.za	ble001@jabber.uct.ac.za	u knw I hav always struggled wit that
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	ok, go thru ur classes n make sure u bind all fields wit text boxes
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	thing is I have an emp table & a userlogin table and I don't know how to integrate the 2

lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za/	try make sure u normalise ur tables
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	How?
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	there shudnt b similar data in da tables
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	oohhh maybe that's what the problem is
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	also enforce referential integrity when u build relationships
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	I think I have redundant data in both tables
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	Ooohhhh
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	oohh now I get it
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	ok try sort it out n let me knw
ble001@jabber.uct.ac.za	kra001@jabber.uct.ac.za	so wat wud u say phone communication is?
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	okay thanks
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	later then
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	Cool
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	hey I think its working now
kra001@jabber.uct.ac.za	ble001@jabber.uct.ac.za	phone com is instant
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	great, at least we seem to be getting somewhere
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	yeah we just need to update the doc as we go along
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	yep the doc is updated...any way let me rush so c u 2mr then
ble001@jabber.uct.ac.za	lal002@jabber.uct.ac.za	enjoy your day
lal002@jabber.uct.ac.za	ble001@jabber.uct.ac.za	thx n u too